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## Norway in the creative age Irene Tinagli



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# Part I

### **Excutive summary**

The research presented in this report measures and analyzes three key dimensions of Norway's economy and society: talent, technology and innovation, and the social context in which they are embedded. It builds upon the theory of the "3Ts" of economic development advanced in The Rise of the Creative Class by American professor Richard Florida, but it expands it by integrating the analysis with a wide range of additional variables such as new firms formation, employment generation, house prices, geographical proximity and connectedness.

The work builds three composite indexes (Talent, Technology, and Tolerance) and a synthetic "Norwegian Creativity Index" that summarizes all three of them. Data and indicators have been collected for all the 429 Norwegian municipalities, and analyzed with reference to the most recent data (Part I of the report) and to the trends registered over time (Part II), thus offering a unique and detailed socio-economic picture of the country and of its trajectory.

The analysis has provided many interesting findings.

#### A CHANGING SOCIETY AND ECONOMY.

Norway is undeniably changing: its society is getting more open and international and its economy more diversified and creative. Almost one fourth of Norwegian workforce is engaged in creative occupations; three hundred and twelve thousands people working in science and engineering, research and development, technology-based industries, in the arts, music, culture, or in the knowledge-based professions of health care, finance and law. An amount that has grown by 45% in the four years between 2003 and 2007, increasing its weight on employment from 20% to 23%. The cities that exhibit the highest levels and growth rates of creative occupations are Stavanger, Sandnes, Trondheim, Bergen, Oslo, Baerum, and Asker.

The changes concern Norway's society as well. More people are coming from abroad, especially from nonwestern countries. The share nonwestern population is almost 20% in Oslo, 16% in Drammen, 13% in Lorenskog, and in many other cities is between 6 and 8%. A trend also found in medium and small cities. This implies a growing diversity of background, ideas, culture and skills.

#### PATTERNS IN ECONOMIC GROWTH.

High levels of talent, diversity and creative occupations appear to be highly correlated to economic growth, new firms creation, employment and property value. The Norwegian Creativity Index (NCI) is positively correlated with new firms' creation. Interestingly, Talent and Tolerance have a strongest correlation with the rates of new firm creation, than high levels of Technology (as measured by high tech industry) suggesting that a solid Talent base and an open and diverse social context are key elements of new entrepreneurial activities. It also worth mentioning, that, although many small cities do not perform equally well on all the three dimensions considered and tend to have, on average, lower levels of creative occupations, the correlation between the Norwegian Creativity Index and the selected measures of economic performance also holds for municipality with fewer than 5,000 inhabitants.

#### A CHANGING GEOGRAPHY.

One of the most interesting findings of the research is the observation of how much the socio-economic geography of the county is also changing. Despite the long-term effort of the Government to "spread out" resources and population throughout the country, patterns of geographical concentrations emerge clearly, particularly among creative resources and innovation. For example, while Oslo accounts for 11,8% of all the

Norwegian population, it accounts for 16.3% of Norwegians with bachelor's degree, 26.5% of all the people with Masters and PhDs, 21.4% of the Norwegian creative class and almost 33% of all the bohemians living in the country. A concentration that continues to grow. We can identify two major areas that have been growing in terms of creative class share: the western corridor Stavanger-Haugesund-Bergen and the Oslo area.

Immigration also shows similar geographic patterns, as it appears much higher in large cities (with Oslo reaching a stunning 24% of foreign population) or in their surroundings (70% of the top 20 cities on the diversity index are located in counties surrounding Oslo).

Even more pronounced the geographic concentration of innovation output (patents). The city of Oslo accounts for 34% of the total number of patents produced in Norway in 2007. The cities of Baerum and Asker account for another 21% and 5% respectively. This means that 60% of the patents produced in Norway are concentrated in Oslo and in the neighboring county of Akershus.

#### THE FUTURE OF SMALL CITIES: THE ROLE OF PROXIMITY AND CONNECTEDNESS.

The increasing concentration of talent and creative resources in large cities does not mean that small ones are doomed. Actually many small-medium cities have performed quite well in the past few years. What appears to have mattered in their development is their connectedness to larger areas.

To better analyze this phenomenon the research builds a variable that represents the proximity and connectedness of a municipality to a large city, called "Centrality". Results show that least central cities have, on average, an overall creativity index that is about half the index recorded by the most central ones. Similarly, least central cities have a much lower concentration of creative class than the one we find in most central cities (10.4% versus 18.4%). Centrality also appears to play a critical role on broader aspects of economic development, such as employment growth. In the years 2000-07 the group of least central cities had an average employment growth rate of almost zero per cent, versus an 8% recorded by the most central cities. Furthermore, results from regression analysis show that the correlation between creative class concentrations and centrality remains significant when controlling for city size. This means that keeping constant a city's size, its degree of connectedness makes a big difference in its attractiveness and economic growth.

#### CHALLENGES AND POLICY IMPICATIONS.

Results from the analysis also evidence some challenges. A big one is to find ways to better leverage Norway's large talent resources and its increasing creative assets to spur higher innovation. Although talent, creative class and diversity have been growing, innovative output has been declining. Employment in high tech industry hasn't grown much, and patenting has been declining in many large cities since 1996. This implies rethinking the innovation policies pursued so far.

Also, the findings concerning the increasing geographic concentration of relevant resources, along with the crucial role of "centrality" for cities' development, highlight the importance of connectedness. This means that Norwegian cities should start thinking in terms of regional growth, connectivity and attractiveness rather than municipal attractiveness alone, and begin working together to address the challenges that lay ahead.

### Introduction

The past 25 years have brought amazing changes in our lives. The economy has shifted from a system based on natural resources and physical inputs to a system driven by knowledge, ideas, creativity and innovation.

This epochal change did not concern the economy alone. It affected our communities, our social fabric, the way the way we work, live and interact with others. It changed the way we see the world and what we want from our lives and ourselves. Not only are we required to be more creative and innovative in our jobs and day to day activities, but we, in turn, require the environment around us to support our creativity and our needs by being more functional, stimulating and engaging.

This poses incredible pressure on cities and regions looking to attract new talents, generate innovation, and spur economic growth. Competing in this increasingly global and demanding scenario is very hard, and traditional recipes of economic growth have failed the test of time.

Traditional models say that economic growth comes from companies or jobs or technology. This report is based on the belief that these models are good starting points but they are incomplete. Economic growth is rooted in human creativity and the ability to mobilize, attract and motivate human beings. This requires creating the necessary conditions – environmental and social conditions - that enable certain places to attract and mobilize more of these creative assets than others.

This report reflects and builds upon the theory of the "3Ts" of economic growth advanced in The Rise of the Creative Class by American professor Richard Florida.

The 3Ts theory argues that economic growth and development turns upon 3Ts: technology, talent and tolerance. Technology is important. It empowers creativity; it provides the means through which new ideas can become new products, new businesses, generating wealth and prosperity. But other factors come into play as well. Technology alone could not produce innovation if it's not accompanied by Talent, the second T. Human capital theorists have long argued that educated people are the key driver of economic development. Cities and regions need not only to attract but to stimulate and motivate talented people. And this is when the third T, Tolerance, comes into play. Only by creating a socially and culturally open environment we can nurture, attract, and mobilize these creative assets.

This approach has already been applied to study and evaluate the creative potential of cities and regions in the United States, Canada, and Europe (Sweden and Italy)<sup>1</sup>.

In this study we use the 3Ts framework to analyze the creative potential of Norwegian cities. It is the first time in studies of this kind that the unit of analysis is not the county, the province or the metropolitan area, but the municipality. This allows a much more fine grained analysis of the processes and drivers of economic growth in many different types of cities, ranging from small towns to large metropolises alike.

By looking inside Norway, analyzing and comparing its cities and regions we can better understand the sources of its competitive advantage, identifying the opportunities and the challenges that lay ahead.

<sup>1)</sup> See: Richard Florida (2002), The Rise of the Creative Class, Basic Books, NY; Richard Florida and Irene Tinagli (2004), Europe in the Creative Age, Demos, London; Meric S. Gertler, Richard Florida, Gary Gates and Tara Vinodrai (2002), Competing on Creativity: Placing Ontario's Cities in North Ameri-

can Context, Ontario Ministry of Enterprise, Opportunity and Innovation and the Institute for Competitiveness and Prosperity;

Irene Tinagli, Richard Florida, Patrik Strom, Evelina Wahlqvist (2007), Sweden in the Creative Age, Hendel School of Business, Economics and Law, University of Gothenburg and Creativity Group Europe; Irene Tinagli and Richard Florida (2005), Italy in the Creative Age, Creativity Group Europe.

### **Chapter 1: Talent**

Talent and creativity are the forces behind technological progress, new inventions, new frontiers in science, technology and the arts. These abilities pertain to humans only. Research has shown that the ability of people to contribute to the full development of a real creative economy is closely linked to their knowledge, education, and their daily activity and occupation.

We measure Talent through three different measures: the Creative Class<sup>SM2,</sup> that is the share of workforce engaged in creative occupations like scientists, professionals, managers, artists and so forth, the Human Capital Index, that is the share of population with a University degree; and the Super Human Capital, represented by the share of population with post graduate degree, Masters and PhDs. The Norwegian Talent Index is composed by these three indicators. In the following sections we show results of top performing Norwegian cities on each on them separately and then on the overall Talent Index.

### **1.1 The Creative ClassSM**

The notion and definition of Creative Class was first introduced in Richard Florida's book "The Rise of the Creative Class", and represents the share of local workforce engaged in conceptual and creative types of occupations, like managers, scientists, architects, engineers, artists, entrepreneurs, and many others. The creative class is a crucial asset for regional and national competitiveness. Research has shown consistent high correlations between the presence of a thriving creative class and indicators of innovation and economic performance. Assessing the concentration and distribution of creative class in a country provides important information to better understand the creative and innovative potential of regions and cities. In the present study we measure the presence of the creative class and its various components in all Norwegian municipalities (data refer to the private sector, in year 2007).

The creative class has various components. The three major ones evidenced in the literature are: Creative Core (scientists, engineers, architects, physicians, college professors, etc.), Creative Professionals (business and finance professionals, legal professionals etc.), and Bohemians (writers, photographers, musicians and the like).

The first two groups are more directly related to the classic notion of "Talent", while the last one, bohemians, is associated to the cultural climate and social openness. For this reason the "Bohemian Index" is included in the Tolerance dimension. Following this approach, we compute a creative class index that excludes Bohemians, which will be accounted for in the Tolerance dimension.

<sup>2)</sup> Creative Class is a Service Mark of Richard Florida

### TABLE 1Creative Class Index - Top 20 municipalities

Table 1 shows the results of the top 20 municipalities on the Creative Class Index.

Position	Municipality	County	Std Score (1)	Creative Class % (without bohemians)	Position	Municipality	County	Std Score	Creative Cl % (withou bohemian
1	Bærum	Akershus	1,000	38,60 %	11	Nittedal	Akershus	0,754	29,45
2	Oppegård	Akershus	0,973	37,59 %	12	Trondheim	Sør-Trøndelag	0,753	29,40
3	Asker	Akershus	0,930	36,01 %	13	Frogn	Akershus	0,750	29,32
4	Stavanger	Rogaland	0,924	35,78 %	14	Røyken	Buskerud	0,727	28,46
5	Oslo kommune	Oslo	0,913	35,36 %	15	Bergen	Hordaland	0,718	28,14
6	Kongsberg	Buskerud	0,894	34,67 %	16	Ås	Akershus	0,716	28,06
7	Nesodden	Akershus	0,813	31,65 %	17	Skedsmo	Akershus	0,710	27,84
8	Ski	Akershus	0,806	31,37 %	18	Fet	Akershus	0,698	27,38
9	Sola	Rogaland	0,782	30,49 %	19	Gjerdrum	Akershus	0,693	27,20
10	Lørenskog	Akershus	0,766	29,91 %	20	Rælingen	Akershus	0,691	27,13
						National Averag	e		22,90

(1) The Standardized score is calculated on the basis of creative class without bohemians, since they are accounted for in the Tolerance Index

#### Creative Class in the private vs. public sector

Our measure of creative class, computed for the private sector only, excludes occupations like legislators and public sector's officers and managers, which were included in the original definition of creative class. Restricting the analysis to private sector provides a better tool to analyze and understand the socio-economic structure and the creative potential of cities, especially the small ones. As previous research has shown, the inclusion of public sector employment in the calculations leads to an overestimation of creative class in administrative capitals cities (this is particularly true in European cities where public sector has a relatively high weight in the economy). Table 2 shows the differences in calculations and in rankings in the case in which public employment is also included in the calculations. As we can see, including the public sector gives an advantage to administrative capitals and cities like Oslo, Trondheim and others, bringing them in a much higher position in the ranking then the one they have if we look at the private sector only.

#### TABLE 2

### Creative Class Index - Including Public Sector or Private Sector only

Includin	ng Public Sector En	nployment	1	Private Sector Only	,
		Total			Total
		Creative			Creative
Position	Municipality	Class %	Position	Municipality	Class %
1	Bærum	34,1%	1	Bærum	40,3%
2	Oslo kommune	32,4%	2	Oppegård	39,0%
3	Oppegård	32,4%	3	Asker	37,5%
4	Asker	31,7%	4	Stavanger	36,9%
5	Trondheim	30,9%	5	Oslo kommune	37,8%
6	Stavanger	30,3%	6	Kongsberg	35,5%
7	Leikanger	29,9%	7	Nesodden	35,0%
8	Bergen	28,1%	8	Ski	32,5%
9	Lørenskog	27,9%	9	Sola	31,1%
10	Ås	27,9%	10	Lørenskog	31,0%
11	Kongsberg	27,8%	11	Nittedal	30,5%
12	Nesodden	27,8%	12	Trondheim	30,7%
13	Tromsø	27,4%	13	Frogn	30,6%
14	Ski	27,3%	14	Røyken	29,6%
15	Nittedal	26,8%	15	Bergen	29,3%
16	Frogn	25,7%	16	Ås	29,0%
17	Skedsmo	25,4%	17	Skedsmo	28,9%
18	Sola	25,3%	18	Fet	28,1%
19	Nøtterøy	24,9%	19	Gjerdrum	28,0%
20	Rælingen	24,9%	20	Rælingen	28,0%

#### **Creative Class composition**

To gauge additional insights on specific features of the Creative Class in Norway it is also interesting to look at its composition and its full magnitude when including bohemians as well. Chart 1 represents the overall composition of creative class in Norway, and Chart 2 shows the composition for the top 20 cities on the creative class index.

#### CHART 1

Overall composition of Creative Class in Norways Top 20 municipalities



Chart 2 shows that cities often differ in how their creative class is structured. For example, Trondheim has one of the highest percentages of "creative core", that is scientists, mathematicians, physicians etc. but a very low relative percentage of creative professionals. This creative class structure reflects a specific socioeconomic context heavily driven by the University and research centers, and helps understanding other city's specificities like its technological and innovative capacity, as we will see in Chapter 3.





#### The geographical distribution of Creative Class

Map 1 shows the concentration of creative class in Norwegian municipalities.

#### MAP 1 The consentration of the Creative Class in Norwegian municipalities



### **1.2 Human Capital**

Human Capital represents the level of knowledge and skills possessed by the individuals in a community or society. The importance of human capital in economic development has been widely described and evidenced in existing literature. Nobel Prizes such as Gary Becker, Robert Lucas and other relevant scholars have shown that education increases productivity, innovation and technological progress. Harvard economist Edward Glaeser points out that the concentration of highly educated people in a place has important "spillover effects" on the quality of the new firms created and on attracting more educated individuals.

Human Capital is typically measured by the share of population with a university degree. However the increasing development of post-graduate education is leading to the creation of a group of "super educated" people that might have distinct effects on regional performance and development. For this reason we build two different indeces of Human Capital: the traditonal one (Human Capital Index) and the "High Human Capital" Index, which measures the percentage of population that has a Master or PhD degree. As we can see from Table 3, the distribution of the two aggregates is not perfectly symmetrical. For example, the municipality of Ås is not even included in the Top 20 on the traditional measure of Human Capital Index, but makes it to the second place on the High Human Capital Index.

### TABLE 3 Human Capital Index and High Human Capital Index

	Human Capital	
Position	Municipality	HC %
1	Bærum	30,5%
2	Asker	30,3%
3	Nesodden	27,9%
4	Oppegård	27,8%
5	Oslo kommune	27,3%
6	Volda	26,8%
7	Førde	26,7%
8	Lillehammer	26,3%
9	Leikanger	26,3%
10	Sogndal	25,8%
11	Frogn	25,1%
12	Molde	24,9%
13	Trondheim	24,8%
14	Bergen	24,8%
15	Bodø	24,8%
16	Levanger	24,7%
17	Stavanger	24,7%
18	Nøtterøy	24,6%
19	Tønsberg	24,3%
20	Kristiansand	24,1%
	Norway	20,8%

Chart 4 shows the results of the top 20 cities on the total stock of human capital (graduate and post graduate degrees) and its relative composition. The city of Baerum, which tops both the Human Capital and High Human Capital rankings, reaches the stunning percentage of 46.5%.



### CHART 4 Human Capital Index and High Human Capital

### **1.3 The Talent Index: Top 50 municipalities**

### TABLE 4

Position	Municipality	County	Talent Index	Creative Class Rank	Human Capital Rank	High Human Capital Rank
1	Bærum	Akershus	1,000	1	1	1
2	Asker	Akershus	0,935	3	2	2
3	Oslo kommune	Oslo	0,865	5	5	4
4	Oppegård	Akershus	0,826	2	4	9
5	Nesodden	Akershus	0,790	7	3	7
6	Stavanger	Rogaland	0,757	4	17	10
7	Ås	Akershus	0,743	16	39	2
8	Trondheim	Sør-Trøndelag	0,733	12	13	6
9	Leikanger	Sogn og fjordane	0,695	49	9	5
10	Kongsberg	Buskerud	0,690	6	21	12
11	Bergen	Hordaland	0,681	15	14	11
12	Frogn	Akershus	0,655	13	11	13
13	Ski	Akershus	0,637	8	26	15
14	Tromsø	Troms	0,634	48	21	8
15	Lillehammer	Oppland	0,608	43	8	14
16	Sola	Rogaland	0,589	9	55	18
17	Nøtterøy	Vestfold	0,588	28	18	20
18	Nittedal	Akershus	0,588	11	45	19
19	Hole	Buskerud	0,578	24	31	17
20	Malvik	Sør-Trøndelag	0,571	23	35	16
21	Lørenskog	Akershus	0.570	10	48	34
22	Røvken	Buskerud	0.564	14	42	32
23	Tønsberg	Vestfold	0,561	35	19	27
24	Hamar	Hedmark	0,560	33	24	25
25	Lier	Buskerud	0.559	26	36	22
26	Vestby	Akershus	0,558	22	39	26
27	Kristiansand	Vest-Agder	0,556	36	20	30
28	Molde	Møre og Romsdal	0,550	60	12	21
29	Bodø	Nordland	0,545	54	15	31
30	Førde	Sogn og fjordane	0,544	93	7	29
31	Skedsmo	Akershus	0,535	17	66	32
32	Sandnes	Rogaland	0.525	25	56	35
33	Gierdrum	Akershus	0.524	19	64	38
34	Volda	Møre og Romsdal	0.520	162	6	24
35	Randaberg	Rogaland	0.511	21	53	52
36	Sogndal	Sogn og fjordane	0.510	161	10	23
37	Stord	Hordaland	0.502	31	30	68
38	Horten	Vestfold	0,490	34	49	47
39	Rælingen	Akershus	0.490	20	90	46
40	Ålesund	Møre og Romsdal	0.489	57	25	52
41	Balestrand	Sogn og fjordane	0.485	39	28	95
42	Grimstad	Aust-Aøder	0.484	59	34	44
43	Drammen	Buskerud	0,483	32	65	43
44	Tiøme	Vestfold	0.482	78	29	36
45	Fet	Akershus	0.475	18	110	51
46	Ulstein	Møre og Romsdal	0.473	42	32	118
47	levanger	Nord-Trøndelag	0.468	165	16	41
48	Lillesand	Aust-Aøder	0.466	83	41	37
49	Time	Rogaland	0.465	50	50	54
50	Bardu	Troms	0.464	30	67	65
	Saraa		0,404	50		

### **Chapter 2: Technology**

Technology contributes enormously to the empowerment of creativity. The productivity and innovativeness of human talent and creativity would be much lower without a solid technological base that allows its full deployment and actualization. However technology is not just a tool; in its many products and innovations is itself a manifestation of human creativity and ingenuity. The Technology Index attempts at capturing both these aspects by using two different indicators: High Tech Industry and Patents.

### 2.1 High Tech Industry

The High Tech Industry Index represents the share of local industry devoted to research, design and manufacturing of technological products such as electronic components, computers, medical equipment, pharmaceuticals, aircraft, spacecraft and so forth. It also includes related services like prototype testing, software development, and other high tech consulting services. The index is calculated as the share of local employment involved in this kind of industry and activity. Results from the index show a very heterogeneous picture in the country. On one hand, there are many cities where high tech industry doies not even exists or it has a negligible presence: 35 cities do not have any kind of high tech industry at all and 209 cities that have a share of high tech industry below 1%. On the other hand, though, we find a group of cities that have a very relevant high tech industry, exhibiting shares of high tech industry among the highest ever found in studies of this kind in other European cities.

Besides the case of Jondal or Modalen (small towns where the presence of one large single company can drive up the numbers), high percentages are also found in larger like Baerum, and medium ones like Horten, Asker and Oppegard. The share of high tech industry found in Oslo is also quite remarkable for a large and diversified city, similar to the percentage registered in Stockolm.

### TABLE 5 The High Tech Industry Score

Position	Municipality	County	High Tech Industry score	HighTech as % of employment	Position	Municipality	County	High Tech Industry score	HighTech as % of employment
1	Jondal	Hordaland	1.000	36.14%	11	Gjerstad	Aust-Agder	0.208	7.53%
2	Horten	Vestfold	0.763	27.57%	12	Fitjar	Hordaland	0.208	7.53%
3	Bærum	Akershus	0.755	27.30%	13	Trondheim	Sør-Trøndelag	0.177	6.41%
4	Modalen	Hordaland	0.651	23.53%	14	Kongsberg	Buskerud	0.174	6.30%
5	Sola	Rogaland	0.523	18.89%	15	Ringerike	Buskerud	0.165	5.98%
6	Asker	Akershus	0.485	17.54%	16	Stryn	Sogn og fjordane	0.160	5.78%
7	Oppegård	Akershus	0.429	15.51%	17	Lier	Buskerud	0.159	5.74%
8	Røyrvik	Nord-Trøndelag	0.261	9.43%	18	Arendal	Aust-Agder	0.156	5.65%
9	Oslo kommune	Oslo	0.243	8.78%	19	Overhalla	Nord-Trøndelag	0.156	5.64%
10	Halden	Østfold	0.209	7.54%	20	Skedsmo	Akershus	0.155	5.61%
						Norway total			4.74%

### **2.2 Patents**

Patents represent the number of new inventions produced by a society in the widest possible domains: new products or processes in traditional industries as well high tech industries, in manufacturing as well as in services. For this reason patents are widely used as a measure of innovativeness.

The use of patents has also its drawbacks. Patenting requires long and expensive legal processes, therefore patents tend to be mostly "produced" by larger firms while smaller ones often rely on more informal types of innovation that escape the patent indicator.

This is why many cities, especially the smaller ones, may not produce any patents at all during a given year. Indeed, 362 cities out of 429 (84%) did not get any patent in 2007. For this reason we considered a time-window of 4 years and then we normalize the number of patents produced in these 4 years by the size of population. Results are shown in Table 6.

#### TABLE 6 Patent Score

Position	Municipality	County	Patents Score	Patents per 10,000 inhab.		Position	Municipality	County	Patents Score	Patents per 10,000 inhab.
1	Bygland	Aust-Agder	1.000	52.56		11	Krødsherad	Buskerud	0.287	15.06
2	Bærum	Akershus	0.836	43.93		12	Oslo kommune	Oslo	0.284	14.92
3	Sigdal	Buskerud	0.748	39.33		13	Horten	Vestfold	0.276	14.51
4	Kongsberg	Buskerud	0.632	33.20		14	Vinje	Telemark	0.262	13.75
5	Asker	Akershus	0.580	30.50		15	Øvre Eiker	Buskerud	0.254	13.37
6	Nøtterøy	Vestfold	0.449	23.61		16	Porsgrunn	Telemark	0.249	13.10
7	Hurum	Buskerud	0.385	20.25		17	Våler (Hedm.)	Hedmark	0.247	12.98
8	Gjerstad	Aust-Agder	0.377	19.84		18	Vestre Toten	Oppland	0.247	12.96
9	Drangedal	Telemark	0.315	16.55		19	Notodden	Telemark	0.237	12.44
10	Ås	Akershus	0.297	15.60	_	20	Dovre	Oppland	0.232	12.17
					-		Norway total			5.45

Due to the normalization small cities with a low absolute number of patents but a high amount relative to their size can be found in the top part of the ranking. However, it is interesting to look at the absolute number of patents as well, to see where the largest amounts of patents are produced in Norway. Table 7 shows the top 20 municipalities by the absolute number of patents produced in 2007 and in the four year window 2004-2007.

### TABLE 7Absolute Number of Patents

Position	Municipality	County	Patents 2007	Patents 2004- 2007	Patents per 10,000 inhab.
1	Oslo	Oslo	111	548	14.92
2	Bærum	Akershus	68	275	43.93
3	Asker	Akershus	18	94	30.50
4	Kongsberg	Buskerud	13	49	33.20
5	Nøtterøy	Vestfold	7	28	23.61
6	Porsgrunn	Telemark	7	27	13.10
7	Drammen	Buskerud	4	27	7.42
8	Skedsmo	Akershus	3	25	9.09
9	Fredrikstad	Østfold	6	25	5.81
10	Arendal	Aust-Agder	4	24	9.78
11	Horten	Vestfold	5	22	14.51
12	Moss	Østfold	1	21	11.92
13	Tønsberg	Vestfold	2	21	9.17
14	Ås	Akershus	2	14	15.60
15	Sandefjord	Vestfold	3	14	5.57
16	Øvre Eiker	Buskerud	1	13	13.37
17	Ringsaker	Hedmark	1	12	6.29
18	Sarpsborg	Østfold	1	12	3.88
19	Hurum	Buskerud	2	11	20.25
20	Ski	Akershus	1	11	6.69
	Norway		329	1553	5.45

CHART 4 Shares of Patents



The city of Oslo accounts for 34% of the total number of patents produced in Norway in 2007 (see Chart 4). The cities of Baerum and Asker account for another 21% and 5% respectively. This means that 60% of all patents produced in Norway in 2007 are concentrated in Oslo and in the neighboring county of Akershus, a finding that confirms the importance of proximity, density and regional connectedness for the development of innovative activities.

### 2.3 The Technology Index: Top 50 municipalities

### TABLE 8

Position	Municipality	County	Technology Index	High tech Rank	Patents Rank
1	Bærum	Akershus	0.796	3	2
2	Asker	Akershus	0.533	6	5
3	Bygland	Aust-Agder	0.529	77	1
4	Horten	Vestfold	0.519	2	13
5	Jondal	Hordaland	0.500	1	103
6	Sigdal	Buskerud	0.403	78	3
7	Kongsberg	Buskerud	0.403	14	4
8	Modalen	Hordaland	0.326	4	103
9	Gjerstad	Aust-Agder	0.293	11	8
10	Nøtterøy	Vestfold	0.276	35	6
11	Oppegård	Akershus	0.274	7	47
12	Oslo kommune	Oslo	0.263	9	12
13	Sola	Rogaland	0.261	5	103
14	Hurum	Buskerud	0.218	94	7
15	Ås	Akershus	0.212	25	10
16	Arendal	Aust-Agder	0.171	18	27
17	Halden	Østfold	0.167	10	44
18	Porsgrunn	Telemark	0.165	48	16
19	Drangedal	Telemark	0.165	257	9
20	Skedsmo	Akershus	0.164	20	32
21	Krødsherad	Buskerud	0.158	181	11
22	Notodden	Telemark	0.157	53	19
23	Øvre Eiker	Buskerud	0.154	87	15
24	Lier	Buskerud	0.150	17	39
25	Frogn	Akershus	0.148	42	24
26	Moss	Østfold	0.141	86	21
27	Vestre Toten	Oppland	0.139	170	18
28	Vinje	Telemark	0.136	321	14
29	Grimstad	Aust-Agder	0.132	28	35
30	Røyrvik	Nord-Trøndela	0.131	8	103
31	Våler (Hedm.)	Hedmark	0.127	345	17
32	Lillesand	Aust-Agder	0.122	131	23
33	Dovre	Oppland	0.122	296	20
34	Sandefjord	Vestfold	0.120	24	59
35	Tønsberg	Vestfold	0.119	68	31
36	Åsnes	Hedmark	0.117	234	22
37	Drammen	Buskerud	0.115	44	37
38	Nes (Busk.)	Buskerud	0.112	163	26
39	Nome	Telemark	0.109	204	25
40	Fitjar	Hordaland	0.104	12	103
41	Os (Hedm.)	Hedmark	0.102	123	33
42	Vegårshei	Aust-Agder	0.102	217	29
43	Svelvik	Vestfold	0.099	34	62
44	Tjøme	Vestfold	0.097	89	38
45	Kragerø	Telemark	0.094	39	66
46	Marker	Østfold	0.094	390	28
47	Hobøl	Østfold	0.093	91	42
48	Åmli	Aust-Agder	0.091	347	30
49	Trondheim	Sør-Trøndelag	0.089	13	103
50	Holmestrand	Vestfold	0.088	32	77

#### Box 1: The relationship between Talent and Technology

The correlation analysis between the Talent and Technology dimensions and of their components provides several interesting insights on the relationship between these two aggregates. The most interesting ones are the following.

1. Talent is positively correlated with Technology. Also, within Talent, Creative Class has a higher correlation with Technology overall and also with Patents and High Tech industry separately than Human Capital alone.



2. Within the Creative Class, Creative Core is more correlated with high tech industry than patents, while creative professionals are more correlated with patents than high tech industry. For example, going back to the case of Trondheim we can see that the city, which has a stronger presence of creative core rather than professionals, has a good performance in high tech industry but a poorer one on patents.



### **Chapter 3: Tolerance**

Creativity and innovation require not only talent, knowledge and technology, but a favorable social context. This means they need an environment that favors the emergence of new ideas, encourages people of all background, beliefs, and interests to blend together and learn from each other, paving the way for the creation of something new. Research conducted in the United States, Canada, and several European countries show that places with high degrees of social openness and diversity have an advantage in attracting and nurturing talent and the creative class.

Measuring Tolerance and social openness is not an easy task. In previous works Tolerance has been usually measured by three types of indicators: degree of ethnic diversity, share of bohemians and artists, and presence of gays and lesbians (or attitudes towards these communities where surveys were available).

As often remarked, the argument is not that immigrants, gays or bohemians "cause" innovation or economic growth. Rather, their presence in large numbers is an indicator of an underlying culture that's open and conducive to creativity. The places that are open and tolerant —the places where gays, bohemians and immigrants feel at home and where there is integration, tend to have a culture of tolerance and open-mindedness.

In the case of Norway, data on gay and lesbian communities are not available, nor are available reliable survey data at the municipality level. For this reason the Norway Tolerance index is composed by two main indicators: the diversity index, based on ethnic diversity, and the bohemian index, based on artistic communities.

### **3.1 Diversity Index**

In earlier 3Ts studies conducted on US cities and regions the indicator for ethnic diversity was represented by the percentage of foreign population. However, subsequent studies conducted in Europe had to take into account that immigration in Europe has very different patterns, features and implications. Some regions and cities have high percentages of foreigners simply because they border with other European countries, a type of "immigration" that usually bears a lower degree of real cultural diversity and that requires lower social openness. To account for this phenomenon in the specific case of Norway, we build a diversity index that does not simply reflect the magnitude of immigration, but also considers its different nature distinguishing between "western" immigration and "non western" immigration. The specific formula used to build the diversity index is described in detail in the Methodological Appendix.

Table 9 shows both the diversity Index and the actual percentages of western and non western foreigners in the 20 most "diverse" Norwegian cities.

Not surprisingly, the city with the highest degree of diversity is Oslo, with the highest share of both western and non western immigrants, with a total of almost 24% of population from a foreign country. However medium-small cities like Drammen, Lørenskog, Skedsmo and many others exhibit high degrees of diversity as well.

It is important to remark that, among smaller cities, the ability to attract foreigners appears to be affected by the proximity to a large metropolitan area: 70% of the top 20 cities on the diversity index are located in counties surrounding Oslo.

### TABLE 9 The Diversity Index

Position	Municipality	County	Diversity Index	Western Foreigners 2007	Non- western Foreigners 2007	Total Foreigners
1	Oslo	Oslo	0.379	4.2%	19.6%	23.8%
2	Drammen	Buskerud	0.307	2.4%	15.9%	18.3%
3	Lørenskog	Akershus	0.269	2.6%	12.9%	15.5%
4	Skedsmo	Akershus	0.248	2.4%	11.7%	14.1%
5	Askim	Østfold	0.241	2.0%	11.7%	13.7%
6	Stavanger	Rogaland	0.226	4.1%	8.4%	12.5%
7	Rælingen	Akershus	0.223	2.3%	10.2%	12.5%
8	Moss	Østfold	0.222	2.5%	9.9%	12.4%
9	Bærum	Akershus	0.221	4.5%	7.7%	12.2%
10	Ås	Akershus	0.221	3.8%	8.4%	12.2%
11	Hemsedal	Buskerud	0.215	6.7%	5.1%	11.8%
12	Asker	Akershus	0.213	4.5%	7.2%	11.7%
13	Båtsfjord	Finnmark	0.212	5.4%	6.2%	11.6%
14	Kristiansand	Vest-Agder	0.200	2.3%	8.7%	11.0%
15	Lier	Buskerud	0.197	2.5%	8.3%	10.8%
16	Nedre Eiker	Buskerud	0.190	2.2%	8.2%	10.4%
17	Ski	Akershus	0.187	2.8%	7.4%	10.2%
18	Ullensaker	Akershus	0.184	2.8%	7.2%	10.0%
19	Vadsø	Finnmark	0.180	2.3%	7.5%	9.8%
		Sogn og				
20	Fjaler	fjordane	0.180	3.7%	6.0%	9.7%
	Norway Total	·	· · · · · · · · · · · · · · · · · · ·	2.3%	6.6%	8.9%

### **3.2 The Bohemian Index**

Artists, writers, musicians, and other "bohemian" types often have alternative lifestyles and seek diverse and open environments where they can be inspired and feel free to express themselves. For this reason concentration of bohemians is used as an indicator of Tolerance in a place. Table 10 shows the top 20 municipalities in Norway with the highest share of workers engaged in artistic occupations.

#### TABLE 10 The Bohemian Index

Position	Municipality	County	Std Score	Bohemians %
1	Nesodden	Akershus	1.000	3.34
2	Oslo kommune	Oslo	0.740	2.47
3	Bykle	Aust-Agder	0.698	2.33
4	Kárásjohka K.	Finnmark	0.608	2.03
5	Bærum	Akershus	0.518	1.73
6	Hamar	Hedmark	0.467	1.56
7	Guovdageaidnu K.	Finnmark	0.461	1.54
8	Asker	Akershus	0.440	1.47
9	Oppegård	Akershus	0.428	1.43
10	Lillehammer	Oppland	0.410	1.37
11	Modalen	Hordaland	0.398	1.33
12	Kristiansand	Vest-Agder	0.395	1.32
12	Trondheim	Sør-Trøndelag	0.395	1.32
14	Frogn	Akershus	0.386	1.29
15	Porsanger P.P.	Finnmark	0.383	1.28
16	Sandefjord	Vestfold	0.374	1.25
17	Luster	Sogn og fjord.	0.368	1.23
18	Sogndal	Sogn og fjord.	0.365	1.22
		Møre og		
19	Molde	Romsdal	0.362	1.21
20	Grue	Hedmark	0.353	1.18

An interesting feature of Bohemians is their distribution in the country. Similar to the case of patents, bohemians show a very uneven distribution across the country, with about 33% of all artists in the country living in Oslo, and almost another 20% living in Bergen, Trondheim, Baerum and Stavanger (see Chart 5).





The ranking based on normalized numbers does not allow observing this uneven distribution across the country. Map 2, which shows bohemians' distribution based on absolute numbers, helps seeing the areas where we find the largest bohemian communities in the country.

MAP 2 Distribution of Bohemians on absolute numbers



Lower outlier (0) < 25% (97) 25% - 50% (97) 50% - 75% (132) > 75% (50) Upper outlier (59)

### **3.3 The Tolerance Index : Top 50 municipalities**

TABLE 11 The Tolerance Index

Position	Municipality	County	Tolerance Index	Boho Index (rank)	Diversity Index (rank)
1	Oslo	Oslo	0.870	2	1
2	Nesodden	Akershus	0.710	1	30
3	Drammen	Buskerud	0.573	24	2
4	Bærum	Akershus	0.547	5	9
5	Lørenskog	Akershus	0.515	31	3
6	Bykle	Aust-Agder	0.509	3	75
7	Asker	Akershus	0.498	8	12
8	Skedsmo	Akershus	0.486	34	4
9	Askim	Østfold	0.465	42	5
10	Stavanger	Rogaland	0.463	28	6
11	Kristiansand	Vest-Agder	0.457	12	14
12	Oppegård	Akershus	0.437	9	24
13	Rælingen	Akershus	0.431	47	7
14	Moss	Østfold	0.430	44	8
15	Ås	Akershus	0.428	44	10
16	Ski	Akershus	0.418	22	17
17	Karasjok	Finnmark	0.417	4	173
18	Hamar	Hedmark	0.400	6	66
19	Sandefjord	Vestfold	0.391	16	37
20	Lier	Buskerud Sør-	0.387	53	15
21	Trondheim	Trøndelag	0.383	12	46
22	Bergen	Hordaland	0.379	24	33
23	Frogn	Akershus	0.375	14	49
24	Lillehammer	Oppland	0.372	10	64
25	Fredrikstad	Østfold	0.371	41	26
26	Nittedal	Akershus	0.370	36	28
27	Vestby	Akershus	0.361	39	36
28	Kongsvinger	Hedmark	0.359	30	39
29	Hemsedal	Buskerud	0.359	129	11
30	Haugesund	Rogaland	0.358	42	34
31	Tønsbergt	Vestfold	0.356	24	45
32	Nedre Eiker	Buskerud	0.353	92	16
33	Sarpsborg	Østfold	0.347	64	23
34	Røyken	Buskerud	0.343	24	58
35	Nøtterøy	Vestfold	0.341	38	48
36	Skien	Telemark	0.335	72	27
37	Tromsø	Troms	0.334	23	74

38	Hol	Buskerud	0.328	72	31
39	Sandnes	Rogaland	0.328	102	22
40	Halden	Østfold	0.323	80	32
41	Sola	Rogaland	0.317	114	21
42	Vadsø	Finnmark	0.316	120	19
43	Rygge	Østfold	0.315	64	40
44	Lillesand	Aust-Agder	0.314	34	89
45	Ullensaker	Akershus	0.312	149	18
46	Kautokeino	Finnmark	0.311	7	287
47	Båtsfjord	Finnmark	0.309	281	13
48	Bø	Telemark	0.308	64	46
49	Kongsberg	Buskerud	0.306	62	50
50	Horten	Vestfold	0.295	98	42

#### **Box 2: Tolerance and Talent**

The correlation analysis between Tolerance and Talent confirms that Tolerance is strongly correlated with the ability to attract and nurture skilled and talented people. In synthesis, the two most interesting findings emerging from the analysis are the following:

1. Talent is highly correlated to Tolerance and social openness not only in large cities, but in smaller ones as well.



2. Within Talent, Creative Class (withouth bohemians) has an even stronger correlation with both components of the Tolerance Index: Bohemians and Diversity.



### **Chapter 4: Putting all together: The Norwegian Creativity Index (NCI)**

Combining the scores of each city on all the 3Ts, we get the Norwegian Creativity Index.

### TABLE 12

Position	Municipality	County	NCI	Talent Index (rank)	Technology Index (rank)	Tolerance Index (rank)
1	Bærum	Akershus	0.781	1	1	4
2	Oslo kommune	Oslo	0.666	3	12	1
3	Asker	Akershus	0.655	2	2	7
4	Nesodden	Akershus	0.525	5	70	2
5	Oppegård	Akershus	0.513	4	11	12
6	Kongsberg	Buskerud	0.466	10	7	49
7	Ås	Akershus	0.461	7	15	15
8	Horten	Vestfold	0.435	38	4	50
9	Stavanger	Rogaland	0.426	6	87	10
10	Trondheim	Sør-Trøndelag	0.402	8	49	21
11	Nøtterøy	Vestfold	0.401	17	10	35
12	Skedsmo	Akershus	0.395	31	20	8
13	Frogn	Akershus	0.392	12	25	23
14	Drammen	Buskerud	0.390	43	37	3
15	Sola	Rogaland	0.389	16	13	41
16	Lørenskog	Akershus	0.379	21	96	5
17	Ski	Akershus	0.378	13	62	16
18	Bergen	Hordaland	0.373	11	84	22
19	Lier	Buskerud	0.365	25	24	20
20	Kristiansand	Vest-Agder	0.357	27	85	11
21	Lillehammer	Oppland	0.355	15	55	24
22	Tønsberg	Vestfold	0.345	23	35	31
23	Hamar	Hedmark	0.341	24	77	18
24	Moss	Østfold	0.340	54	26	14
25	Tromsø	Troms	0.336	14	117	37
26	Nittedal	Akershus	0.333	17	113	26
27	Vestby	Akershus	0.332	26	60	27
28	Bygland	Aust-Agder	0.328	107	3	303
29	Røyken	Buskerud	0.321	22	89	34
30	Rælingen	Akershus	0.320	38	121	13
31	Modalen	Hordaland	0.312	76	8	127
32	Sandefjord	Vestfold	0.311	61	34	19
33	Hurum	Buskerud	0.305	62	14	61
34	Leikanger	Sogn og fjord.	0.305	9	221	129
35	Sandnes	Rogaland	0.304	32	80	39

37       Arendal       Aust-Agder       0.292       53       16         38       Tjøme       Vestfold       0.291       44       44         39       Porsgrunn       Telemark       0.288       72       18         40       Grimstad       Aust-Agder       0.286       42       29         41       Bykle       Aust-Agder       0.285       111       324         42       Hole (t.o.m. 1963)       Buskerud       0.284       19       74         43       Gjerdrum       Akershus       0.283       28       175         44       Molde       Møre og Rom.       0.283       98       17         45       Halden       Østfold       0.280       87       51         46       Bø (Telem.)       Telemark       0.281       51       59         47       Fredrikstad       Østfold       0.280       87       51         48       Haugesund       Rogaland       0.279       51       154         49       Askim       Østfold       0.277       265       5       5         50       Jondal       Hordaland       0.277       265       5       5	36	Lillesand	Aust-Agder	0.301	48	32	44
38       Tjøme       Vestfold       0.291       44       44         39       Porsgrunn       Telemark       0.288       72       18         40       Grimstad       Aust-Agder       0.286       42       29         41       Bykle       Aust-Agder       0.285       111       324         42       Hole (t.o.m. 1963)       Buskerud       0.284       19       74         43       Gjerdrum       Akershus       0.284       33       107         44       Molde       Møre og Rom.       0.283       28       175         45       Halden       Østfold       0.283       98       17         46       Bø (Telem.)       Telemark       0.281       51       59         47       Fredrikstad       Østfold       0.280       87       51         48       Haugesund       Rogaland       0.279       51       154         49       Askim       Østfold       0.278       157       76         50       Jondal       Hordaland       0.277       265       5       51         51       Karasjok       Einnmark       0.270       85       260 <td>37</td> <td>Arendal</td> <td>Aust-Agder</td> <td>0.292</td> <td>53</td> <td>16</td> <td>79</td>	37	Arendal	Aust-Agder	0.292	53	16	79
39       Porsgrunn       Telemark       0.288       72       18         40       Grimstad       Aust-Agder       0.286       42       29         41       Bykle       Aust-Agder       0.285       111       324         42       Hole (t.o.m. 1963)       Buskerud       0.284       19       74         43       Gjerdrum       Akershus       0.284       33       107         44       Molde       Møre og Rom.       0.283       28       175         45       Halden       Østfold       0.283       98       17         46       Bø (Telem.)       Telemark       0.281       51       59         47       Fredrikstad       Østfold       0.280       87       51         48       Haugesund       Rogaland       0.279       51       154         49       Askim       Østfold       0.278       157       76         50       Jondal       Hordaland       0.277       265       5       51         51       Karasiok       Einnmark       0.270       85       260	38	Tjøme	Vestfold	0.291	44	44	52
40       Grimstad       Aust-Agder       0.286       42       29         41       Bykle       Aust-Agder       0.285       111       324         42       Hole (t.o.m. 1963)       Buskerud       0.284       19       74         43       Gjerdrum       Akershus       0.284       33       107         44       Molde       Møre og Rom.       0.283       28       175         45       Halden       Østfold       0.283       98       17         46       Bø (Telem.)       Telemark       0.281       51       59         47       Fredrikstad       Østfold       0.280       87       51         48       Haugesund       Rogaland       0.279       51       154         49       Askim       Østfold       0.278       157       76         50       Jondal       Hordaland       0.277       265       5       5         51       Karasjok       Einnmark       0.270       85       260	39	Porsgrunn	Telemark	0.288	72	18	51
41       Bykle       Aust-Agder       0.285       111       324         42       Hole (t.o.m. 1963)       Buskerud       0.284       19       74         43       Gjerdrum       Akershus       0.284       33       107         44       Molde       Møre og Rom.       0.283       28       175         45       Halden       Østfold       0.283       98       17         46       Bø (Telem.)       Telemark       0.281       51       59         47       Fredrikstad       Østfold       0.280       87       51         48       Haugesund       Rogaland       0.279       51       154         49       Askim       Østfold       0.278       157       76         50       Jondal       Hordaland       0.277       265       5       5         51       Karasjok       Einnmark       0.270       85       260	40	Grimstad	Aust-Agder	0.286	42	29	90
42       Hole (t.o.m. 1963)       Buskerud       0.284       19       74         43       Gjerdrum       Akershus       0.284       33       107         44       Molde       Møre og Rom.       0.283       28       175         45       Halden       Østfold       0.283       98       17         46       Bø (Telem.)       Telemark       0.281       51       59         47       Fredrikstad       Østfold       0.280       87       51         48       Haugesund       Rogaland       0.279       51       154         49       Askim       Østfold       0.278       157       76         50       Jondal       Hordaland       0.277       265       5       5         51       Karasjok       Einnmark       0.270       85       260	41	Bykle	Aust-Agder	0.285	111	324	6
43       Gjerdrum       Akershus       0.284       33       107         44       Molde       Møre og Rom.       0.283       28       175         45       Halden       Østfold       0.283       98       17         46       Bø (Telem.)       Telemark       0.281       51       59         47       Fredrikstad       Østfold       0.280       87       51         48       Haugesund       Rogaland       0.279       51       154         49       Askim       Østfold       0.278       157       76         50       Jondal       Hordaland       0.277       265       5       5         51       Karasjok       Einnmark       0.270       85       260	42	Hole (t.o.m. 1963)	Buskerud	0.284	19	74	135
44       Molde       Møre og Rom.       0.283       28       175         45       Halden       Østfold       0.283       98       17         46       Bø (Telem.)       Telemark       0.281       51       59         47       Fredrikstad       Østfold       0.280       87       51         48       Haugesund       Rogaland       0.279       51       154         49       Askim       Østfold       0.278       157       76         50       Jondal       Hordaland       0.277       265       5       5         51       Karasjok       Einnmark       0.270       85       260	43	Gjerdrum	Akershus	0.284	33	107	58
45       Halden       Østfold       0.283       98       17         46       Bø (Telem.)       Telemark       0.281       51       59         47       Fredrikstad       Østfold       0.280       87       51         48       Haugesund       Rogaland       0.279       51       154         49       Askim       Østfold       0.278       157       76         50       Jondal       Hordaland       0.277       265       5       5         51       Karasjok       Einnmark       0.270       85       260	44	Molde	Møre og Rom.	0.283	28	175	59
46       Bø (Telem.)       Telemark       0.281       51       59         47       Fredrikstad       Østfold       0.280       87       51         48       Haugesund       Rogaland       0.279       51       154         49       Askim       Østfold       0.278       157       76         50       Jondal       Hordaland       0.277       265       5       5         51       Karasjok       Einnmark       0.270       85       260	45	Halden	Østfold	0.283	98	17	40
47       Fredrikstad       Østfold       0.280       87       51         48       Haugesund       Rogaland       0.279       51       154         49       Askim       Østfold       0.278       157       76         50       Jondal       Hordaland       0.277       265       5       5         51       Karasjok       Finnmark       0.270       85       260	46	Bø (Telem.)	Telemark	0.281	51	59	48
48         Haugesund         Rogaland         0.279         51         154           49         Askim         Østfold         0.278         157         76           50         Jondal         Hordaland         0.277         265         5         5           51         Karasjok         Finnmark         0.270         85         260	47	Fredrikstad	Østfold	0.280	87	51	25
49         Askim         Østfold         0.278         157         76           50         Jondal         Hordaland         0.277         265         5         5           51         Karasjok         Finnmark         0.270         85         260	48	Haugesund	Rogaland	0.279	51	154	30
50         Jondal         Hordaland         0.277         265         5         5           51         Karasiok         Finnmark         0.270         85         260	49	Askim	Østfold	0.278	157	76	9
51 Karasiok Finnmark 0.270 85 260	50	Jondal	Hordaland	0.277	265	5	334
	51	Karasjok	Finnmark	0.270	85	260	17

The most interesting aspect emerging from the NCI is the difficulty of many cities to register good performances on all the 3Ts. Not only most cities appear to have an advantage on only one or two dimensions, but the gap between the well performing dimension(s) and the other(s) in some cases is really large.

The magnitude of these gaps is among the largest ever recorded in studies of this kind conducted in other European countries and it is mostly related to the unit of analysis. For the first time the unit of analysis is not the county, the province or the metropolitan area: the unit of observation this time is the municipality. And these results are telling us that it is very hard for municipalities alone to perform well on all the three Ts. When well functioning and coordinated, counties and regions seem to be better able to nurture and leverage the necessary social and economic conditions for a prosperous and creative society.

## **Chapter 5: The NCI, economic performance and territorial assets**

How does the Norwegian Creativity Index relate to more traditional measures of economic wealth and prosperity? And what role is played by non economic aspects such as geographical proximity, connectedness or urban density? These are important questions to better understand the drivers of regional prosperity and set effective policies. In the following sections we provide the main results of an articulated analysis (correlation analysis, regression and other analyses) that can help setting the debate about the role of creativity in spurring local economic development and the role of non economic, territorial assets in supporting the development of more attractive and creative communities.

### 5.1 The NCI and economic performance

To explore the relationship between the Norwegian Creativity Index (NCI) and more traditional measures of economic development we have selected three economic variables that are among the most interesting and relevant in regional development: mean income, property value (mean house prices) and new firms' creation. Results from the correlation analysis suggest a highly positive relationship of the NCI with all the economic variables considered. Three main findings emerge from the analysis.

1. The Norwegian Creativity Index is positively correlated with local wealth. Also, among the dimensions composing the NCI (the 3Ts) the most highly correlated with wealth are Talent and Tolerance. This is an interesting finding in light of the "technologist recipes" widely in fashion few years ago. High-tech industry has often been considered the biggest if not the only driver of growth and prosperity in a city. But that is not always the case. Previous research in the US and in other European countries has pointed out the limits of this approach and the present study on Norwegian cities shows how this is even truer in Norway. The ability to create an open, tolerant community and to nurture, develop and attract a wide talent base is a crucial element of urban and regional prosperity.







2. The Norwegian Creativity Index is positively correlated with new firms' creation. In particular, Talent and Tolerance appear to have the strongest correlation with the rates of new firm creation, suggesting that a solid Talent base and an open and diverse social context are the two most important elements to spur new entrepreneurial activities.



3. Cities that have a high score on the NCI also register higher property value. That is, cities with high creative potential have significantly higher house prices than less creative ones. This finding has both encouraging and worrying implications. On one hand it represents a strong incentive for cities to be more sensitive to the factors that enhance their attractiveness, vibrancy and creativity. On the other hand it implies that the achievement of higher degrees of creative development may undermine affordability and social equity. As prices in these areas go up, they may end up excluding from the city the same kind of people they want and need to attract: young talented people, artists, and so forth.



4. The relationship between the Norwegian Creativity Index and the selected measures of economic performance also holds for smaller cities (cities with fewer than 5,000 inhabitants). In some circumstances studies it has been claimed that the model of creative development does not hold for small towns. Certainly, as we have seen in the previous chapter, it is more difficult for small cities to compete on all the three Ts. If we look at variables like high tech industry, patents or bohemians it is obvious that small cities do not show relationship between these aggregates and economic growth simply because these are phenomena rarely found in small towns. However, when evaluated in its entirety, the creative potential of small cities, and especially their base of talent and of social openness are highly correlated with local wealth, property value and new firms' creation.





### 5.2 Non-economic variables: proximity and connectedness

Looking at the tables and rankings shown in previous chapters we can see that, in many cases, the top performing cities tend to gravitate around large cities or metropolitan areas like Oslo. Proximity to a large city (or embeddedness into a metropolitan region) seems particularly relevant along the dimensions of creative class and diversity. In other words: the ability to nurture and attract creative individuals from around the country and from abroad appears to be crucially linked to the proximity to a large urban area.

In order to analyze this phenomenon in deeper detail we built a variable that represents the proximity of a municipality to a large urban center, we called it "Centrality". The Centrality measure captures both how large is the closest urban center and how long does it take to get there. Therefore, it can be considered as a measure of connectedness rather than mere physical distance. The variable can take four values, ranging from 0 for the least central cities, till the value of 3 for the most central ones. In this way we can divide all Norwegian cities in four groups, depending on their degree of centrality or connectedness.

Calculating the mean values of the Norwegian Creativity Index (NCI) for the four different groups of cities we get very clear and stunning results: the least central cities have, on average, an overall creativity index that is about half the index recorded by the most central cities. Similarly, least central cities have, on average, a concentration of creative class that is considerably lower than the one we find in most central cities (10.4% versus 18.4%). These results are even more relevant for the concentration of bohemians: the average percentage of bohemians in the most central cities is almost three times larger than the one found in the least central ones.



**Creative Class and Centrality** 



Creative Class % (without bohemians)

Centrality appears to have also a critical role on broader aspects of economic development, such as employment growth rates. In the years 2000-2007 the group of least central cities had an average employment growth rate of almost zero per cent, while the most central cities recorded an average of 8% employment growth.



Furthermore, results from regression analysis show that the correlation between creative class concentrations and centrality remain significant even when controlling for city size. This means that keeping constant a city's size, its degree of connectedness makes a big difference in its ability to attract talent and to spur economic growth.

The policy implications are very relevant, because although it is very hard to dramatically change a city's size in a short time span, its connectedness can be improved through new, sustainable infrastructure.



Employment Growth 2000-2007

### **Chapter 6: Conclusions**

Almost one fourth of Norwegian workforce is engaged in creative occupations; three hundred and twelve thousands people working in science and engineering, research and development, technology-based industries, in the arts, music, culture, aesthetic and design industries, or in the knowledge-based professions of health care, finance and law. Although this a lower level than the one found in countries like Sweden or the United States, it is still a remarkable share of the national economy, higher than the one found in other European countries like Italy or Austria.

A large part of this people lives in Oslo and in surrounding cities and regions, where we find concentrations of creative class ranging between 30 and 38%. However, interesting concentrations of creative class are also found in other parts of the country, such as around Bergen, Trondheim and Tromsø, showing a pervasive creative potential across the country.

The Talent potential also emerges from the high levels of Human Capital characterizing the whole country and, in particular, Oslo and neighboring municipalities like Baerum, where the population with a graduate or postgraduate degree almost reaches 50%. These southern areas also appear very diverse and attractive for foreigners from all over the world.

Although Norway is often depicted as a relatively low tech country - especially compared to Sweden - results show that high tech industry and services are starting to be a relevant component of several Norwegian cities' economy.

This combination of high levels of talent and emerging technological basis represents a great potential for the country that needs to find a way to better leverage and coordinate these assets to further enhance its innovative and creative capability.

The issue of coordination seems of extreme relevance in Norway, where 55% of all municipalities has less than 5,000 inhabitants.

The average small size of Norwegian cities makes it difficult for each municipality to perform equally well on all the 3ts dimensions (talent, technology and tolerance). However, the main tenets of the 3Ts theory, particularly those concerning the role of talent, and of an open and tolerant social environment emerge as critical for the development and prosperity of all Norwegian cities, regardless of size.

Indeed, what really seems to make a difference in Norwegian cities' creativity and growth potential is not as much size as it is connectedness to larger urban areas.

Smaller cities that can provide fast and easy access to larger urban areas have higher concentration of creative class, diversity, and an average score on the overall Norway creativity index that is almost double the score registered by peripheral and isolated cities.

This finding has interesting policy implications for Norway. The possibility of improving a city's creative potential by linking it to other cities and larger centers paves the way to a new model of regional and urban development. A model based on a well functioning network of cities connected through a web of green, sustainable public transportation, as opposed to the model of sprawling metropolis that we have seen both in industrialized and developing countries. This model could be a new approach to regional development, more attuned to Norwegian specificities and lifestyle, and could represent a sustainable alternative to the progressive sprawling of large cities that have characterized many cities, especially in the US.
# Part II

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### **PART II**

### Norwegian Cities over time: Analyzing Trends

### **Chapter 1: Introduction**

The analysis of Norwegian cities run so far is an interesting picture built around the most recent available data. But additional useful information can be inferred by looking not just at the latest data, but also at the trends of the past few years. Only by looking at these trends we can have a full understanding of how Norway is evolving and its trajectory.

The analysis of the trends poses some methodological issues. Since trends are calculated as percentage changes, they can be very sensitive to the underlying absolute values and to city size. For example, a town that has just one patent or one worker in the creative class in one year and reaches two patents or two creative workers in the next year will show a 100% improvement. However, it would be impossible for a larger city that has, for example, 5000 creative workers, to duplicate that amount in a year.

To address this issue and to make the results comparable, we created 5 different groups based on city size and run the analysis within each group separately. Table 1 illustrates the different groups that have been created, the underlying criteria and some descriptive characteristics of the cities in each group (number of cities included in each group, average population, average weight of the creative class on the local workforce)

City Group	Grouping criteria	g criteria N. of cities Avg. group population		Avg % of Creative Class	Avg % of Bohemia ns
Large	pop > 30,000	25	85,036	24.0%	1.1%
M/Large	10,000 < pop < 30,000	78	17,113	19.2%	0.7%
Medium	5,000 < pop < 10,000	89	7,049	14.6%	0.5%
Small	2,500 < pop < 5,000	108	3,577	12.3%	0.3%
Tiny	pop < 2,500	128	1,496	10.5%	0.2%

#### TABLE 1: The five groups of cities

For each group we have calculated indicators, standardized values and rankings. Therefore cities are only been compared and analyzed in reference to cities in the same size group. In this document we will show the results and ranking on each indicator only for the 25 cities belonging to the large sized city group. When we will calculate the synthetic index for each of the macro-dimension of Talent, Tolerance and Technology we will show the full ranking for the 25 largest cities, plus the top five cities of each of the other groups. The rankings relative to the overall Norwegian Creativity Trend Index for all groups analyzed are shown in Appendix.

### **Chapter 2: Talent Indicators' Trends**

Looking at the historical data on creative occupations and educational level of the population provides very interesting information about local dynamics and attractiveness.

To evaluate the trends in creative class and human capital, we calculated the average annual change of each indicator in the time period for which we had available and comparable data (2003-2007 for creative class and 1995-2007 for the others). Since our indicators are not absolute values but represent shares and percentages (share of creative workforce, share of educated population etc.), we looked the simple change in such shares (differences in percentage points). The analysis offers very interesting results.

- The growth of the creative class in some large cities has been much stronger and faster than the simple growth of human capital and educational degrees. For example, in the short time span between 2003 and 2007 creative class percentage on the workforce jumped from 28.3% to 35.8% in Stavanger, a higher growth of the one registered by human capital in the thirteen years between 1995 and 2007 (23.2% to 28.9%).
- Creative class growth appears to be concentrated not just in isolated municipalities, but in broader areas and regions. Access to a variety of resources and proximity to large cities appears critical to attract creative class.
- Talent wants to be close to other talent. The large cities that have registered the highest creative class growth rates are the ones that had the highest rates of creative class to begin with. And a similar trend can be observed for high human capital (masters and PhDs), while simple human capital shows a more even pattern of growth across cities1

#### **2.1 Creative Class Trends**

Results from the creative class trend analysis show that Stavanger and Sandnes are, among the large cities, the ones with the highest growth in creative class shares. It is worth noting that these two cities are contiguous and belongs to the same "conurbation". Also, quite interestingly, topping the ranking in the among the medium-large cities group, we find Sola, the place where the Stavanger airport is located.

Among the best performing cities for creative class growth we also find cities with important academic and international communities like Bergen and Trondheim, as well as cities like Oslo, Asker and Bærum, which all belong to the same metropolitan area (and even in the smaller cities group, cities that gravitate in this area exhibit higher growth rates, like Gjerdrum, which tops the ranking of the medium cities group).

In synthesis, we can identify two major areas that have been growing considerably in terms of creative class share: the western corridor Stavanger-Haugesund-Bergen and the Oslo area. This result points out at the role of regions and connectedness within regions to boost creative class growth and attractiveness.

A final consideration concerns the disaggregated analysis of occupational trends. Since the indicators

1) The correlation is higher for large cities and diminishes as city size gets smaller.

are built on changes in shares (share of creative class over workforce), they may hide useful information on overall workforce trends. It is therefore interesting to observe the trends two aggregates separately (absolute changes in creative occupations and in total workforce between 2003 and 2007). Table 2 shows us the absolute percentage changes of both creative class and total employment between 2003 and 2007. The table allows us to appreciate the two trends separately and to see, for example, that cities that exhibit a lower position of the creative class growth rank are not necessarily cities in which creative class did not grow. They might just be cities that witnessed a high overall employment growth, like Tromsø or Sarpsborg, for example, but the growth of creative class was proportional to such change, and therefore the weight of the creative class on the total employment did not change much.

#### TABLE 2:

	Municipality	Avg annual change (difference in % points)	Total change 2003-2007 (difference in % points)	Creative Class % 2003	Creative Class % 2004	Creative Class % 2005	Creative Class % 2006	Creative Class % 2007
1	Stavanger	1.86	7.46	28.3%	28.5%	29.8%	34.5%	35.8%
2	Sandnes	1.38	5.54	20.4%	21.0%	21.5%	25.1%	26.0%
3	Trondheim	1.09	4.35	25.0%	25.6%	26.3%	27.9%	29.4%
4	Asker	1.01	4.05	32.0%	32.8%	34.1%	35.2%	36.0%
5	Haugesund	0.98	3.91	15.5%	16.2%	17.4%	19.8%	19.5%
6	Bærum	0.95	3.79	34.8%	35.7%	37.6%	38.3%	38.6%
7	Bergen	0.92	3.67	24.5%	25.0%	26.1%	28.1%	28.1%
8	Oslo	0.84	3.36	32.0%	32.1%	33.5%	34.4%	35.4%
9	Kristiansand	0.81	3.25	20.2%	19.5%	20.4%	22.4%	23.4%
10	Karmøy	0.79	3.17	11.7%	12.1%	12.9%	14.2%	14.9%
11	Bodø	0.75	2.99	18.1%	18.5%	19.4%	21.0%	21.1%
12	Tønsberg	0.73	2.91	20.5%	20.1%	21.2%	22.4%	23.4%
13	Lørenskog	0.65	2.58	27.3%	27.3%	28.8%	29.3%	29.9%
14	Skedsmo	0.61	2.45	25.4%	26.3%	27.0%	27.1%	27.8%
15	Ålesund	0.60	2.39	18.5%	18.8%	19.4%	20.3%	20.9%
16	Sandefjord	0.51	2.05	19.0%	19.1%	20.2%	20.8%	21.1%
17	Drammen	0.50	1.99	22.0%	22.3%	22.9%	23.7%	24.0%
18	Larvik	0.35	1.40	15.3%	15.5%	16.0%	16.2%	16.7%
19	Skien	0.33	1.33	16.8%	16.7%	17.5%	18.0%	18.2%
20	Arendal	0.32	1.30	18.7%	18.0%	18.2%	19.2%	20.0%
21	Tromsø	0.24	0.96	20.8%	20.2%	21.2%	21.2%	21.8%
22	Porsgrunn	0.21	0.85	19.0%	19.1%	19.6%	19.9%	19.9%
23	Ringsaker	0.11	0.43	14.6%	14.2%	14.6%	14.1%	15.0%
24	Sarpsborg	0.10	0.39	14.9%	14.2%	14.8%	15.2%	15.3%
25	Fredrikstad	-0.04	-0.16	17.4%	16.4%	16.9%	17.2%	17.2%

The absolute percentage changes of both Creative Class and Total Employment between 2003 and 2007

#### TABLE 3: Total Creative Class and total Employment Change 2003 -2007

	Municipality	Total Creative Class change (2003-2007)	Total Employment change (2003-2007)
1	Stavanger	81.47%	43.63%
2	Sandnes	77.91%	39.94%
3	Trondheim	53.91%	31.12%
4	Asker	42.81%	26.73%
5	Haugesund	78.32%	42.50%
6	Bærum	39.85%	26.11%
7	Bergen	53.50%	33.45%
8	Oslo	47.84%	33.81%
9	Kristiansand	50.92%	29.98%
10	Karmøy	65.48%	30.29%
11	Bodø	50.56%	29.21%
12	Tønsberg	39.42%	22.13%
13	Lørenskog	29.58%	18.39%
14	Skedsmo	44.64%	31.92%
15	Ålesund	44.32%	27.82%
16	Sandefjord	28.44%	15.96%
17	Drammen	39.47%	27.89%
18	Larvik	24.13%	13.69%
19	Skien	27.46%	18.14%
20	Arendal	39.00%	30.00%
21	Tromsø	52.23%	45.51%
22	Porsgrunn	26.06%	20.65%
23	Ringsaker	28.16%	24.51%
24	Sarpsborg	51.06%	47.18%
25	Fredrikstad	36.36%	37.65%

Comparing the performance on the static indicators (indicator referring to the last available year) with the trends calculated for the past few years, we can better examine the behavior of the analyzed cities and built a "creative class matrix" (see Figure 1) that distinguishes between four different groups of cities:

• Leaders. Stavanger, Sandnes, Trondheim, Bergen, Oslo, Bærum, and Asker. These cities have been constantly increasing the share of creative class in the past years and are the places with the highest concentrations of creative class in Norway.

- Moving Up. Haugesund, Kristiansand, Karmøy, Bodø. These cities do not have high concentration of creative class yet, but have shown interesting trends in the past few years and appear well positioned to compete in the years ahead.
- Sleeping beauties. Lørenskog, Skedsmo, Drammen and, in a way, Tønsberg. These are cities that have high concentrations of creative class (all benefiting from the proximity to the Oslo area), but haven't shown high growth rates in the past few years. They should be careful in not losing their edge and attractiveness.
- Laggards. Sarpsborg, Ringsaker, Fredrikstad, Porsgrunn, Arendal, Skien, Larvik. These are the cities in worst shape among the large cities group. They do not show very high concentration of creative class nor do they exhibit signs of reversing the trend.



#### FIGURE 1: The Creative Class Matrix

### 2.2 Human Capital Trends

Table 4 and table 5 show the trends in Human Capital and High Human Capital in the 25 largest Norwegian cities since 1995.

Tønsberg, Ålesund, Trondheim, Frederikstad and Kristiansand are the top 5 cities as far as human capital growth is concerned. While Oslo, Tromsø, Bareum, Asker and Bergen are the top 5 cities on the high human capital growth.

It is interesting to note how most of the cities that perform well on the high human capital trend index are the same cities that scored well on the creative class trend index. As we shall see in the next section, the correlation between creative class growth and high human capital growth is very high.

TABLE 4		
Trends in	Human	Capital

	A Municipality: chai		Total difference in % points	Human Capital % 1995-2007 (selected years)				
		2007	1995-2007	1995	2000	2005	2006	2007
1	Tønsberg	0.0339	6.92	23.2%	26.2%	29.6%	29.6%	30.1%
2	Ålesund	0.0357	6.91	21.3%	24.0%	27.0%	27.7%	28.2%
3	Trondheim	0.0349	6.70	22.4%	25.4%	28.1%	28.8%	29.1%
4	Fredrikstad	0.0347	6.58	17.2%	20.0%	22.8%	23.4%	23.8%
5	Kristiansand	0.0327	6.27	22.7%	25.6%	28.0%	28.6%	29.0%
6	Bodø	0.0315	6.02	23.0%	25.4%	28.1%	28.8%	29.0%
7	Porsgrunn	0.0346	5.96	16.1%	18.3%	20.9%	21.7%	22.1%
8	Karmøy	0.0375	5.94	13.9%	16.0%	18.9%	19.2%	19.9%
9	Drammen	0.0331	5.83	19.1%	22.0%	23.9%	24.4%	24.9%
10	Stavanger	0.0321	5.70	23.2%	26.3%	28.4%	28.9%	28.9%
11	Skien	0.0303	5.69	16.8%	19.3%	21.5%	22.0%	22.5%
12	Sandnes	0.0437	5.68	18.5%	21.2%	23.9%	24.2%	24.2%
13	Sarpsborg	0.0343	5.36	14.7%	17.0%	19.4%	19.7%	20.0%
14	Haugesund	0.0322	5.33	20.9%	23.1%	25.9%	26.4%	26.2%
15	Larvik	0.0289	5.31	17.6%	20.0%	22.2%	22.5%	23.0%
16	Sandefjord	0.0309	5.19	18.8%	21.3%	23.2%	23.8%	24.0%
17	Bergen	0.0254	5.07	24.8%	27.1%	29.2%	29.6%	29.8%
18	Arendal	0.0243	5.04	20.2%	22.3%	24.6%	24.9%	25.3%
19	Skedsmo	0.0361	5.03	19.1%	21.5%	23.6%	24.0%	24.2%
20	Ringsaker	0.0265	4.93	14.5%	16.6%	18.4%	18.9%	19.4%
21	Tromsø	0.0274	4.31	22.9%	25.0%	26.8%	27.4%	27.2%
22	Lørenskog	0.0236	4.06	20.9%	22.7%	24.3%	24.7%	25.0%
23	Asker	0.0183	3.96	32.4%	34.6%	36.2%	36.3%	36.4%
24	Oslo	0.0253	3.66	28.1%	30.3%	31.3%	31.7%	31.7%
25	Bærum	0.0140	3.24	34.2%	35.9%	37.2%	37.4%	37.5%

#### TABLE 5 Trends in High Human Capital

	Municipality:	Average annual change	Total difference in % points	High Human Capital % 1995-2007 (selected years)				
		1995-2007	1995-2007	1995	2000	2005	2006	2007
1	Oslo	0.446	5.35	10.2%	12.6%	14.6%	15.0%	15.5%
2	Tromsø	0.378	4.54	7.2%	9.2%	10.9%	11.2%	11.8%
3	Bærum	0.376	4.51	15.2%	17.3%	19.2%	19.4%	19.7%
4	Asker	0.373	4.48	12.6%	14.6%	16.2%	16.5%	17.0%
5	Bergen	0.355	4.25	7.1%	8.8%	10.7%	11.0%	11.4%
6	Trondheim	0.344	4.12	9.1%	10.9%	12.7%	13.0%	13.3%
7	Stavanger	0.330	3.95	7.6%	9.2%	10.7%	11.2%	11.5%
8	Tønsberg	0.245	2.94	4.8%	5.9%	7.1%	7.3%	7.7%
9	Sandnes	0.200	2.40	4.2%	5.2%	6.2%	6.4%	6.6%
10	Kristiansand	0.196	2.35	5.0%	5.9%	6.9%	7.1%	7.4%
11	Lørenskog	0.190	2.28	4.4%	5.5%	6.4%	6.6%	6.7%
12	Bodø	0.181	2.17	5.0%	5.7%	6.6%	6.8%	7.1%
13	Skedsmo	0.164	1.96	4.9%	5.7%	6.4%	6.7%	6.9%
14	Drammen	0.160	1.92	4.2%	5.1%	5.6%	5.9%	6.1%
15	Ålesund	0.158	1.90	3.6%	4.3%	5.1%	5.4%	5.5%
16	Haugesund	0.158	1.90	3.8%	4.5%	5.6%	5.7%	5.7%
17	Fredrikstad	0.152	1.82	3.2%	3.9%	4.7%	4.8%	5.0%
18	Arendal	0.149	1.79	4.2%	4.9%	5.6%	5.8%	6.0%
19	Sandefjord	0.135	1.62	3.3%	4.1%	4.7%	4.8%	4.9%
20	Porsgrunn	0.125	1.50	4.4%	5.4%	5.6%	5.8%	5.9%
21	Skien	0.114	1.37	3.7%	4.3%	4.8%	4.9%	5.1%
22	Larvik	0.108	1.29	3.1%	3.7%	4.1%	4.2%	4.3%
23	Ringsaker	0.076	0.91	2.6%	3.0%	3.4%	3.5%	3.5%
24	Karmøy	0.065	0.78	1.5%	1.9%	2.2%	2.3%	2.3%
25	Sarpsborg	0.062	0.74	2.6%	2.9%	3.2%	3.2%	3.3%

### **2.3 Talent Trend Index**

Putting together the trends on creative class shares, human capital and high human capital percentages, we obtain the "Talent Trend Index".

Table 6 shows the full ranking of the 25 largest Norwegian cities, while Table 7 shows the top 5 cities for each of the other groups.

Pank		Talent	Creative	Human	High Human
nain	Municipality	Trend	Class	Capital	Capital
position		Index	Trend	Trend	Trend
1	Stavanger	1.386	1	10	7
2	Trondheim	1.170	3	3	6
3	Tønsberg	0.670	12	1	8
4	Sandnes	0.628	2	12	9
5	Bergen	0.518	7	17	5
6	Kristiansand	0.372	9	5	10
7	Ålesund	0.315	15	2	15
8	Asker	0.271	4	23	4
9	Oslo	0.249	8	24	1
10	Bodø	0.194	11	6	12
11	Haugesund	0.069	5	14	16
12	Bærum	-0.016	6	25	3
13	Drammen	-0.126	17	9	14
14	Karmøy	-0.141	10	8	24
15	Tromsø	-0.191	21	21	2
16	Skedsmo	-0.299	14	19	13
17	Fredrikstad	-0.311	25	4	17
18	Sandefjord	-0.405	16	16	19
19	Porsgrunn	-0.405	22	7	20
20	Skien	-0.435	19	11	21
21	Lørenskog	-0.520	13	22	11
22	Arendal	-0.559	20	18	18
23	Larvik	-0.570	18	15	22
24	Sarpsborg	-0.884	24	13	25
25	Ringsaker	-0.981	23	20	23

# TABLE 6Talent Trend Index for the 25 largest Norwegian cities

The ranking simply summarizes the analyses run in the previous sections and does not need further comments on the performance of each cities along the individual indicators.

However, through a look at all the indicators jointly we can note an interesting pattern: cities that tend to score well on the creative class trend also tend to score well on the high human capital indicator (master and PhDs degrees), but not on the human capital indicator (simple bachelor or university diploma degrees). Vice versa, cities that exhibit a positive trend on the human capital indicator do not seem to fare as well on the creative class and high human capital indicators. A simple correlation analysis supports this pattern. As shown in figure 2 and 3, the trend in creative class concentration does not show any correlation with the trend in human capital, while it shows a strong positive correlation with the trend of high human capital.



FIGURE 2: Creative Class growth rate vs. Human Capital Growth rate

FIGURE 3: Creative Class growth rate vs. High Human Capital Growth rate



#### TABLE 7 Talent Trend Index – top 5 cities in the various size groups.

	Rank position	Municipality	Talent Trend Index	Creative Class Trend	Human Capital Trend	High Human Capital Trend
	1	Sola	2.019	1	9	4
	2	Malvik	1.799	6	2	3
M/Large	3	Oppegård	1.697	5	33	2
cities	4	Time	1.298	7	3	19
(Top 5)	5	Frogn	1.162	12	14	6
	1	Randaberg	1.690	2	3	17
Medium	2	Gjerdrum	1.633	1	46	2
cities	3	Volda	1.507	44	1	3
(Top 5)	4	Ulstein	1.424	4	10	15
	5	Hole	1.345	9	62	1
	1	Aure	10.295	n.a.	1	1
Small	2	Bardu	1.304	1	26	50
cities	3	Rennesøy	1.051	3	8	2
(Top 5)	4	Austrheim	1.026	2	105	31
	5	Fjaler	0.956	4	2	34
	1	Leikanger	1.612	7	70	1
Tiny	2	Tolga	1.301	12	6	19
cities	3	Høylandet	1.223	16	24	5
(Top 5)	4	Etnedal	1.203	14	10	18
	5	Os	1.200	18	11	15

### **Chapter 3: Technology Trend Index**

Trend in Technology is represented by the trend in high tech industry employment and in patenting activities. Results show a very interesting pattern: many largest cities shows declining high tech industries and even patenting activities. This pattern might be the result of the internet crisis of the early 2000 and might indicate how large cities have managed to diversify and change the structure of their industry. However, the overall decrease of patenting activities in so many large Norwegian cities might also represent a sign of decreased innovative capacity and should deserve further attention and analysis. The increase of high tech industry and of patenting activities in some medium and small sized cities like Notodden, Nøtteroy or Horten may partially compensate for the decrease in larger areas, but it will be difficult for them to fully substitute the role of large cities in producing large scale innovation.

#### 3.1 High Tech Industry

Data on employment in high tech industry trace back to 2000, therefore we calculated the average annual growth rate for a 7 year time span (2000-2007).

With very few exceptions (like Bærum among the largest cities), employment in high tech industry hasn't grown much in Norwegian cities. Indeed, in most large cities high tech industry has reduced its weight on the local economy.

	Municipality	High Tech Employment avg annual change 2000-2007	High Tech Industry (% of empl.) 2000	High Tech Industry (% of empl.) 2001	High Tech Industry (% of empl.) 2002	High Tech Industry (% of empl.) 2003	High Tech Industry (% of empl.) 2004	High Tech Industry (% of empl.) 2005	High Tech Industry (% of empl.) 2006	High Tech Industry (% of empl.) 2007
1	Bærum	0.0161	16.0%	16.4%	29.3%	29.5%	28.8%	28.3%	28.7%	27.3%
2	Larvik	0.0016	1.3%	1.9%	2.0%	2.2%	2.1%	2.1%	2.5%	2.4%
3	Sandefjord	0.0011	4.1%	4.5%	4.3%	4.4%	4.5%	4.4%	5.1%	4.8%
4	Porsgrunn	0.0007	2.5%	2.3%	2.7%	2.6%	2.6%	2.5%	3.0%	3.0%
5	Ålesund	0.0007	2.1%	2.4%	2.4%	2.4%	2.4%	2.7%	2.7%	2.6%
6	Karmøy	0.0007	0.9%	1.0%	1.2%	1.2%	1.2%	1.3%	1.5%	1.4%
7	Trondheim	0.0004	6.1%	6.0%	6.1%	6.2%	5.9%	5.8%	6.6%	6.4%
8	Sarpsborg	0.0003	1.2%	1.2%	1.2%	1.1%	1.2%	1.4%	1.5%	1.4%
9	Bodø	0.0003	1.9%	1.9%	2.4%	2.9%	2.6%	2.7%	2.2%	2.2%
10	Skedsmo	0.0002	5.5%	6.1%	6.8%	6.7%	6.3%	6.0%	5.9%	5.6%
11	Drammen	0.0001	3.1%	3.1%	3.0%	3.2%	3.1%	3.2%	3.3%	3.2%
12	Kristiansand	0.0000	4.2%	4.1%	4.0%	3.9%	3.9%	3.6%	4.5%	4.2%
13	Arendal	0.0000	5.6%	7.3%	6.9%	6.7%	6.6%	6.1%	6.0%	5.7%
14	Tønsberg	-0.0001	2.3%	3.0%	3.2%	2.9%	3.0%	2.7%	2.4%	2.3%
15	Skien	-0.0002	1.4%	1.2%	1.3%	1.2%	1.3%	1.2%	1.3%	1.2%
16	Bergen	-0.0003	4.4%	4.4%	4.7%	4.7%	4.7%	4.4%	4.4%	4.2%
17	Tromsø	-0.0003	3.1%	2.5%	2.7%	3.0%	3.2%	3.1%	3.0%	2.9%
18	Sandnes	-0.0007	4.8%	5.2%	5.4%	5.7%	5.8%	4.6%	4.6%	4.4%
19	Haugesund	-0.0009	2.4%	2.7%	2.6%	3.0%	2.3%	2.2%	1.9%	1.8%
20	Asker	-0.0010	18.2%	40.0%	51.9%	22.9%	20.9%	19.2%	18.3%	17.5%
21	Lørenskog	-0.0014	1.9%	2.1%	1.9%	2.1%	1.5%	1.1%	1.0%	0.9%
22	Ringsaker	-0.0015	2.8%	2.8%	2.7%	2.7%	1.7%	1.6%	1.8%	1.7%
23	Fredrikstad	-0.0016	3.4%	3.4%	2.7%	2.5%	2.1%	2.2%	2.4%	2.3%
24	Stavanger	-0.0022	5.7%	4.9%	5.3%	4.9%	4.6%	5.1%	4.5%	4.2%
25	Oslo	-0.4%	11.3%	11.3%	9.4%	8.5%	8.4%	8.8%	9.1%	8.8%

# TABLE 8High Tech Industry Trend in the 25 largest cities

### **3.2 Patents**

To evaluate the patent trends we have maintained the approach adopted in the "static" analysis, in which we looked at the number of patents produced in a 4-year window rather than in one year only. We built three such "windows": 1996-2000, 2000-2004, and 2004-2007 and looked at the changes occurred over time.

Table 9 shows the changes for the largest cities group. As we can see, several cities had zero patents in the late Nineties and did not show improvements over time. In terms of change rates this performance places them in a better position compared to those cities that had a positive patent count in the Nineties and saw that diminishing over the years. Indeed, the ranking shows many large cities that have been considerably losing their "innovative" productivity. Oslo, Skedsmo, Asker, Tønsberg, they have all lowered their patenting activity since 1996.

#### TABLE 9 The Patent trends

Rank position	Municipality	Patents per 10,000 pop. Average annual change*	Patents per 10,000 pop 1996-2000	Patents per 10,000 pop 2000-2004	Patents per 10,000 pop 2004-2007
1	Bærum	5.98	31.96	37.49	43.93
2	Porsgrunn	3.19	6.73	7.03	13.10
3	Arendal	0.01	9.75	11.20	9.78
4	Kristiansand	0.00	0.00	0.00	0.00
4	Sandnes	0.00	0.00	0.00	0.00
4	Stavanger	0.00	0.00	0.00	0.00
4	Haugesund	0.00	0.00	0.00	0.00
4	Karmøy	0.00	0.00	0.00	0.00
4	Bergen	0.00	0.00	0.00	0.00
4	Ålesund	0.00	0.00	0.00	0.00
4	Trondheim	0.00	0.00	0.00	0.00
4	Bodø	0.00	0.00	0.00	0.00
4	Tromsø	0.00	0.00	0.00	0.00
14	Lørenskog	-0.08	4.23	4.14	4.06
15	Drammen	-0.47	8.36	7.44	7.42
16	Ringsaker	-0.58	7.46	4.74	6.29
17	Sarpsborg	-0.85	5.58	3.33	3.88
18	Skien	-1.24	5.74	5.26	3.25
19	Tønsberg	-1.40	11.97	8.31	9.17
20	Sandefjord	-1.50	8.57	11.82	5.57
21	Fredrikstad	-1.84	9.49	9.72	5.81
22	Skedsmo	-2.53	14.15	7.08	9.09
23	Oslo	-2.60	20.11	17.55	14.92
24	Larvik	-3.22	8.46	6.14	2.02
25	Asker	-4.86	40.22	47.47	30.50

### **3.3 Technology Trend Index**

Averaging out the performance of each city on the high tech industry trend indicator and the patenting trend indicator we obtain the "Technology Trend Index". Table 9 reports the full ranking for the 25 cities in the largest cities group, while table 10 shows the top 5 cities of each other group.

#### TABLE 10 The Technology Trend Index

Donk		Tashnalagu	High Tech	Patents
Rank	Municipality	Technology	Trend	Trend
position		Trena Index	position	position
1	Bærum	3.876	1	1
2	Porsgrunn	0.958	4	2
3	Ålesund	0.168	5	4
4	Karmøy	0.168	6	4
5	Trondheim	0.130	7	4
6	Bodø	0.114	9	4
7	Kristiansand	0.075	12	4
8	Arendal	0.074	13	3
9	Bergen	0.028	16	4
10	Tromsø	0.020	17	4
11	Sandnes	-0.026	18	4
12	Drammen	-0.036	11	15
13	Haugesund	-0.056	19	4
14	Sarpsborg	-0.095	8	17
15	Sandefjord	-0.147	3	20
16	Lørenskog	-0.147	21	14
17	Stavanger	-0.245	24	4
18	Skien	-0.274	15	18
19	Ringsaker	-0.288	22	16
20	Tønsberg	-0.290	14	19
21	Larvik	-0.504	2	24
22	Skedsmo	-0.530	10	22
23	Fredrikstad	-0.617	23	21
24	Oslo	-1.085	25	23
25	Asker	-1.272	20	25

#### TABLE 11 The Technology Trend Index

	Rank position	Municipality	Technology Trend Index	High Tech Trend position	Patents Trend position
	1	Horten	3.014	2	3
	2	Sola	2.199	1	22
M/Large	3	Notodden	1.524	7	1
cities	4	Nøtterøy	1.291	13	2
(Top 5)	5	Ullensaker	0.780	3	66
	1	Nord-Fron	1.694	6	3
Medium	2	Svelvik	1.665	1	75
cities	3	Åsnes	1.660	58	1
(Top 5)	4	Hurum	1.304	34	2
	5	Nome	1.271	15	4
	1	Gjerstad	4.769	1	3
Small	2	Overhalla	2.406	2	10
cities	3	Drangedal	2.234	31	1
(Top 5)	4	Sigdal	2.006	42	2
	5	Nes (Busk.)	1.607	14	5
	1	Jondal	4.911	1	6
Tiny	2	Bygland	4.815	7	1
cities	3	Modalen	1.655	2	6
(Top 5)	4	Røyrvik	1.452	3	6
	5	Åmli	0.702	91	2

### **Chapter 4: Tolerance Trend Index**

The Tolerance index is composed by three indicators: the share of foreign population coming from western countries, the share of foreign population coming from non-western countries, and the concentration of artists and bohemians as a share of the workforce. In the "static" analysis the former two were combined to form one "diversity index". In the trend analysis it is more advisable to keep the two indices separated to evaluate their distinct evolution. Both of them will still be counted in the final Tolerance Trend Index and assigned equal weights.

### 4.1. Foreign Population Trends

The data on foreign population trace back to 1995 and show very interesting trends over the thirteen years considered. The diversity in Norway has increased considerably, but the biggest part of this increase come from nonwestern immigration rather than western one. The share of western foreign population remains under 2-3% in almost all the biggest Norwegian cities (Table 12), while the share nonwestern population reaches remarkable levels: almost 20% in Oslo, 16% in Drammen, 13% in Lørenskog, and in many other cities is between 6 and 8% (table 13). Such trend is also found in medium and small cities.

#### TABLE 12 The Share of Western foreign Population

	Municipality	Western Foreign pop. Avg annual change 1995-	Western Foreign Pop. as % of total pop. 1995-2007 (Selected years)				
		2007	1995	2000	2005	2006	2007
1	Asker	0.0583	3.8	4.7	4.4	4.3	4.5
1	Tromsø	0.0583	2.1	2.7	2.7	2.9	2.8
3	Haugesund	0.0500	1.3	1.8	1.9	1.8	1.9
4	Ålesund	0.0417	1	1.4	1.4	1.4	1.5
4	Trondheim	0.0417	1.4	1.7	1.8	1.9	1.9
6	Bærum	0.0333	4.1	4.7	4.4	4.4	4.5
7	Sandefjord	0.0333	1.9	2.3	2.3	2.2	2.3
8	Oslo	0.0333	3.8	4.4	4.2	4.1	4.2
8	Lørenskog	0.0333	2.2	3	2.7	2.6	2.6
10	Tønsberg	0.0250	1.9	2.2	2.2	2.2	2.2
11	Fredrikstad	0.0250	1.8	2.1	2.1	2.1	2.1
11	Porsgrunn	0.0250	1.7	1.9	2	1.9	2
11	Bergen	0.0250	1.8	2	2	2	2.1
11	Ringsaker	0.0250	1	1.1	1.2	1.2	1.3
15	Skedsmo	0.0167	2.2	2.5	2.5	2.5	2.4
15	Drammen	0.0167	2.2	2.4	2.5	2.4	2.4
15	Bodø	0.0167	0.9	1	1.1	1.1	1.1
18	Sarpsborg	0.0167	1.6	1.8	1.8	1.8	1.8
18	Karmøy	0.0167	1.2	1.4	1.3	1.3	1.4
20	Arendal	0.0083	1.9	2	1.9	1.9	2
20	Skien	0.0083	1.6	1.8	1.8	1.7	1.7
22	Kristiansand	0.0083	2.2	2.3	2.2	2.2	2.3
22	Larvik	0.0083	1.7	1.8	1.8	1.8	1.8
24	Sandnes	0.0000	2.2	2.2	2	2.1	2.2
25	Stavanger	-0.0167	4.3	4.3	3.6	3.7	4.1

# TABLE 13The Share of Non Western foreign Population

	Municipality	NonWestern Foreign pop. Avg	NonWestern Foreign Pop. as % of total pop. 1995-2007 (Selected years)				
		1995-2007	1995	2000	2005	2006	2007
1	Lørenskog	0.758	3.8	5.9	10.8	11.7	12.9
2	Drammen	0.725	7.2	10.1	14.3	15.1	15.9
3	Oslo	0.675	11.5	14.3	18.2	18.9	19.6
3	Skedsmo	0.675	3.6	5.5	9.7	10.6	11.7
5	Sarpsborg	0.467	2	3.2	6.2	6.9	7.6
6	Fredrikstad	0.458	1.6	3.1	5.8	6.5	7.1
7	Sandnes	0.392	2.5	4	6	6.4	7.2
8	Skien	0.383	2.8	4.4	6.4	6.9	7.4
9	Haugesund	0.367	2.4	3.9	4.8	5.4	6.8
10	Sandefjord	0.358	1.9	3	5.2	5.6	6.2
11	Asker	0.342	3.1	4.1	5.7	6.4	7.2
11	Bærum	0.342	3.6	4.7	6.5	7.1	7.7
13	Stavanger	0.325	4.5	5.7	7.2	7.6	8.4
14	Kristiansand	0.317	4.9	6.1	7.9	8.2	8.7
15	Tønsberg	0.300	1.9	2.8	4.3	4.8	5.5
16	Larvik	0.292	2.1	3.2	4.8	5.1	5.6
17	Porsgrunn	0.267	2.1	3.6	4.6	4.8	5.3
18	Bergen	0.267	3.4	4.1	5.6	6	6.6
19	Trondheim	0.225	3.1	3.8	5	5.4	5.8
20	Arendal	0.208	2.3	3.2	4.2	4.5	4.8
21	Tromsø	0.175	1.7	2.3	3.2	3.5	3.8
21	Ålesund	0.175	1.6	2.1	2.9	3.2	3.7
23	Bodø	0.150	1.3	1.7	2.8	2.9	3.1
24	Karmøy	0.133	1.3	2.1	2.5	2.7	2.9
25	Ringsaker	0.100	1.2	1.3	1.9	2.1	2.4

Looking at the rankings for medium and small sized cities (not shown here), and comparing them to the ones on creative class growth we can also appreciate a positive correlation between the growth of creative class and nonwestern immigration growth. Cities that have seen an increase in nonwestern immigration tend to register a growth in creative class concentrations too. Such correlation is particularly relevant in small and very small cities.

### 4.2. Bohemians Trend

The changes in artists and bohemians concentration appear to have been fairly small in the time frame between 2003 and 2007. As shown by table 14, the only cities that show some relevant increase are Oslo and Haugesund and, to a lesser extent, Arendal.

#### TABLE 14 The Share of Bohemians

	Municipality	Bohemians avg annual change 2003-2007	Bohemians as % of total workforce 2003-2007					
			2003	2004	2005	2006	2007	
1	Oslo	0.072	2.18	2.42	2.44	2.39	2.47	
2	Haugesund	0.061	0.76	0.64	0.80	0.96	1.00	
3	Arendal	0.031	0.46	0.42	0.46	0.46	0.59	
4	Skedsmo	0.027	0.97	0.94	0.98	1.02	1.08	
5	Kristiansand	0.027	1.21	1.28	1.29	1.35	1.32	
6	Fredrikstad	0.026	0.90	0.86	0.98	1.11	1.01	
7	Bærum	0.025	1.63	1.68	1.69	1.67	1.73	
8	Porsgrunn	0.023	0.70	0.77	0.72	0.65	0.79	
9	Drammen	0.019	1.07	1.12	1.09	1.10	1.14	
10	Lørenskog	0.015	1.03	1.15	1.23	1.08	1.09	
11	Sarpsborg	0.012	0.77	0.81	0.77	0.72	0.82	
12	Ålesund	0.012	0.82	0.78	0.87	0.87	0.87	
13	Sandefjord	0.012	1.20	1.23	1.24	1.07	1.25	
14	Asker	0.012	1.42	1.52	1.56	1.47	1.47	
15	Karmøy	0.008	0.41	0.46	0.49	0.36	0.44	
16	Trondheim	0.007	1.29	1.24	1.37	1.27	1.32	
17	Skien	0.006	0.76	0.82	0.82	0.87	0.79	
18	Tønsberg	0.003	1.13	1.23	1.27	1.12	1.14	
19	Bergen	-0.001	1.15	1.09	1.06	1.15	1.14	
20	Tromsø	-0.004	1.18	1.17	1.01	1.15	1.16	
21	Sandnes	-0.012	0.74	0.68	0.68	0.69	0.69	
22	Bodø	-0.016	0.91	0.90	0.92	0.90	0.84	
23	Ringsaker	-0.018	0.59	0.56	0.52	0.46	0.52	
24	Larvik	-0.029	0.89	0.92	0.82	0.91	0.77	
25	Stavanger	-0.037	1.28	1.13	1.20	1.13	1.13	

Similarly to what emerged from the static analysis, bohemians tend to be very much concentrated in few places and such concentration seems to increase over time. As shown by the correlation coefficients reported in table 15, large cities that had a higher concentration of bohemians in 2003 tended to have higher growth rates in the following years, while smaller cities that had relatively high concentration of bohemians in 2003 tended to lose them afterwards (negative correlation with growth rates).

## TABLE 15The Correlation between Bohemians and growth rates

City Group		Correlation Boho % in 2003 - Boho avg annual growth 2003-2007
Large	( > 30,000)	0.29
M/Large	(10,000-30,000)	0.02
Medium	(5,000-10,000)	-0.46
Small	(2,500-5,000)	-0.34
Tiny	(< 2,500)	-0.72

### **4.3 Overall Tolerance Trend Index**

Putting together the trends on the three indicators – western immigration, nonwestern immigration and bohemians – we obtain the Tolerance Trend Index.

Table 15 show the results for the 25 largest Norwegian cities, while table 17 shows the top 5 cities for each of the other city group.

Oslo Haugensund and Lørenskog are the top 3 cities on the Tolerance Trend Index, the ones that managed to grow on all the indicators. Skedsmo, Drammen and Asker also fared pretty well on the overall Tolerance Index, although they shows different immigration pattern that may have affected their social and cultural diversity balance (on over-immigration of nonwestern foreigners in Lørenskog and Drammen, versus a predominantly western immigration in Asker).

#### TABLE 16 The overall Tolerance Trend Index

		Tolerance	Western	NonWestern	Bohemians
	Municipality	Trend	Foreigners	Foreigners	Trend
		Index	Trend (rank)	Trend (rank)	(rank)
1	Oslo	1.583	8	3	1
2	Haugesund	1.180	3	9	2
3	Lørenskog	0.951	8	1	10
4	Skedsmo	0.654	15	3	4
5	Drammen	0.632	15	2	9
6	Asker	0.621	1	11	14
7	Fredrikstad	0.404	11	6	6
8	Bærum	0.328	6	11	7
9	Sandefjord	0.182	7	10	13
10	Tromsø	0.112	1	21	20
11	Sarpsborg	0.071	18	5	11
12	Trondheim	0.036	4	19	16
13	Ålesund	0.014	4	21	12
14	Porsgrunn	0.010	11	17	8
15	Kristiansand	-0.155	22	14	5
16	Tønsberg	-0.202	10	15	18
17	Arendal	-0.298	20	20	3
18	Bergen	-0.312	11	18	19
19	Skien	-0.318	20	8	17
20	Karmøy	-0.585	18	24	15
21	Sandnes	-0.712	24	7	21
22	Ringsaker	-0.846	11	25	23
23	Bodø	-0.892	15	23	22
24	Larvik	-0.968	22	16	24
25	Stavanger	-1.489	25	13	25

#### TABLE 17 The overall Tolerance Trend Index

		Municipality	Tolerance Trend Index	Western Foreigners Trend (rank)	NonWestern Foreigners Trend (rank)	Bohemians Trend (rank)
	1	Ullensaker	2.269	1	1	32
	2	Nannestad	1.295	2	9	39
M/Large	3	Askim	1.257	53	2	10
cities	4	Stokke	1.130	6	40	4
(Top 5)	5	Kongsberg	1.124	3	23	13
	1	Gjerdrum	1.659	1	19	12
Medium	2	Stryn	1.598	8	2	10
cities	3	Bø	1.165	12	5	25
(Top 5)	4	Songdalen	1.137	67	1	11
	5	Flekkefjord	1.017	3	12	65
	1	Fjaler	2.814	1	1	28
Small	2	Hjelmeland	1.815	5	5	12
cities	3	Evje og Hornn	1.220	44	3	10
(Top 5)	4	Steigen	1.153	25	34	2
	5	Suldal	1.098	10	28	8
	1	Fyresdal	1.782	1	33	99
Tiny	2	Hemsedal	1.505	3	56	20
cities	3	Balestrand	1.311	2	54	37
(Top 5)	4	Midsund	1.287	66	2	3
	5	Stordal	1.283	4	29	22

### **Chapter 5: The Norwegian Creativity Trend Index**

The Norwegian Creativity Trend Index (NCTI) unifies the performance of Norwegian cities on all the three macro dimensions of Talent, Technology and Tolerance. As every synthetic measure it needs to be "handled with care", keeping in mind the individual indicators underlying the final score and driving it.

However, it is still a ready-to-use measure that allows catching with a glimpse the major trends in Norway in terms of the three Ts. Table 18 shows the results for the 25 largest Norwegian cities, while table 19 reports the top 5 cities of all the other size groups.

#### TABLE 18

#### The Norwegian Creativity Trend Index

NCTI rank	Municipality	Norwegian Creativity Trend Index (NCTI)	Talent Trend (Rank)	Technology Trend (Rank)	Tolerance Trend (Rank)
1	Bærum	1.000	12	1	8
2	Trondheim	0.548	2	5	12
3	Haugesund	0.525	11	13	2
4	Oslo	0.454	9	24	1
5	Porsgrunn	0.425	19	2	14
6	Ålesund	0.415	7	3	13
7	Drammen	0.410	13	12	5
8	Kristiansand	0.382	6	7	15
9	Lørenskog	0.381	21	16	3
10	Bergen	0.373	5	9	18
11	Tønsberg	0.364	3	20	16
12	Tromsø	0.326	15	10	10
13	Sandnes	0.318	4	11	21
14	Skedsmo	0.308	16	22	4
15	Stavanger	0.280	1	17	25
16	Sandefjord	0.277	18	15	9
17	Asker	0.275	8	25	6
18	Fredrikstad	0.252	17	23	7
19	Karmøy	0.247	14	4	20
20	Bodø	0.243	10	6	23
21	Arendal	0.211	22	8	17
22	Sarpsborg	0.192	24	14	11
23	Skien	0.173	20	18	19
24	Larvik	0.012	23	21	24
25	Ringsaker	0.000	25	19	22

#### TABLE 19 The Norwegian Creativity Trend Index

	NCTI rank	Municipality	Norwegian Creativity Trend Index (NCTI)	Talent Trend (Rank)	Technology Trend (Rank)	Tolerance Trend (Rank)
	1	Sola	1.000	1	2	60
	2	Horten	0.921	25	1	46
M/Large	3	Nøtterøy	0.904	9	4	11
cities	4	Ullensaker	0.837	69	5	1
(Top 5)	5	Nittedal	0.753	11	61	7
	1	Svelvik	1.000	82	2	8
Medium	3	Hurum	0.952	12	4	10
cities	4	Stryn	0.923	73	26	2
(Top 5)	6	Nord-Fron	0.879	40	1	56
	8	Gjesdal	0.867	23	6	26
	1	Gjerstad	1.000	44	1	76
Small	3	Drangedal	0.866	65	3	6
cities	4	Fjaler	0.832	5	23	1
(Top 5)	7	Nes	0.703	35	5	29
	9	Sigdal	0.698	72	4	61
	1	Jondal	1.000	76	1	70
Tiny	2	Bygland	0.967	51	2	90
cities	4	Modalen	0.751	115	3	9
(Top 5)	7	Fyresdal	0.671	22	77	1
	8	Røyrvik	0.663	87	4	47

Also, by comparing the performance of Norwegian cities on the Norwegian Creativity Trend Index (NCTI) with their position on the static Norwegian Creativity Index (NCI), we can see which cities not only shows high average levels of talent, tolerance and technology, but also which cities, among them, have been nurturing these dimensions in the past few years, creating the premises to be leaders for long time ahead.

Figure 4 shows the results of such analysis and classifies cities in four groups:

• Leaders. Bærum, Oslo, Trondheim, there are the top leaders that have best cultivated the 3Ts over the past few years and appear to have created the conditions to continue leading the country in terms of creative potential. However, also Drammen, Lørenskog, Kristiansand and Bergen appear to be in very good shape.

- Moving Up. Haugesund, Porsgrunn, and Ålesund are the up-and-coming cities that, while coming from a lower starting point, managed to gain ground and to establish themselves as interesting places on the Norwegian map.
- Laggards. Ringsaker, Larvik, Skien, Sarpsborg these are the cities that need to work harder to catch up with other cities of comparable dimensions and to set up a strategic plan to fully enter the creative age.
- Sleeping Beauties. Asker, Stavanger, Skedsmo: these are the cities that, while blessed with very good starting points and favorable geographic position, did not seem to work hard enough to nurture all the social and technological conditions needed to keep their edge and maintain their leadership.



#### FIGURE 4 Cities classified in four groups combining NCTI and NCI

### **Chapter 6: Conclusions**

Norwegian society is undeniably changing. More people are coming from abroad, especially from non western countries. While the share of western foreign population remains under 2-3% in almost all the biggest Norwegian cities, the share nonwestern population reaches remarkable levels: almost 20% in Oslo, 16% in Drammen, 13% in Lorenskog, and in many other cities is between 6 and 8%. Such trend is also found in medium and small cities. This implies a growing diversity of background, ideas, culture and skills: a diversity that brings many opportunities but also challenges that will have to be managed.

Also, an increasing share of the Norwegian workforce is employed in creative occupations. In the four years between 2003 and 2007 the creative class in Norway has grown, in absolute terms, by 45%, jumping by almost 100,000 units. Its weight on the overall employment has gone from 20% to 23%, with high variations from city to city. For example, the creative class percentage on the workforce jumped from 28.3% to 35.8% in Stavanger, and from 20.4% to 26% in Sandnes.

The growth of creative class appears to be concentrated not just in isolated municipalities, but in broader areas and regions. The example of Stavanger and Sandnes is emblematic in this case, but there are many other relevant cases like Oslo, Baerum and Asker. Access to a variety of resources and proximity to large cities seems critical to nurture and attract the creative class.

In synthesis, critical mass seems very important for talent attraction, especially critical mass of talent itself: talent wants to be close to other talent. Large cities that have registered the highest creative class growth rates are the ones that had the highest rates of creative class to begin with. A similar trend can be observed for high human capital (masters and PhDs), while simple human capital (bachelor degrees) shows a more even pattern of growth across cities.

However, the most interesting pattern of geographic distribution over the past few years is the one observed in artists and bohemians. Bohemians appear to be increasingly moving to large cities. As shown in the analysis, large cities that had a higher concentration of bohemians in 2003 tended to have higher bohemian inflows in the following years, while smaller cities that had relatively high concentration of bohemians in 2003 tended to lose them afterwards (negative correlation with growth rates). This means that bohemians have increasingly chosen larger metro areas over smaller places, even when those small places used to have a relatively good concentration of artists.

Many big cities have thus become centers for creative and artistic activities, diversifying their social and economic fabric. This might also be correlated to another trend that we have observed over the past ten years: a noticeable decrease in high tech industry and technological innovation in most large cities. This trend is accompanied by an increase of high tech industry and of patenting activities in some medium and small sized cities like Notodden, Notteroy or Horten. This phenomenon suggests a progressive "decentralization" of high tech industry towards more peripheral places, while larger centers and metropolitan areas are getting more diversified and "creative" in their social and economic models. In some ways this could be considered a physiological process, however, the overall decrease of patenting activities in so many large Norwegian cities might also represent a sign of decreased innovative capacity and should deserve further attention and analysis. In fact, the increase of high tech activities in small and medium cities may only partially compensate the loss of technological industries and innovation in larger areas.

In synthesis, Norwegian cities and regions are going through an important social, economic and geographic transformation. Both society and the economy are getting more diverse, educated and "creative": people are increasingly educated and engaged in creative occupations and will seek ways to "feed" and further develop their creativity and talent. It is probably for this reason that we witness a change in geographic dynamics as well. Highly educated talent, creative workers and bohemians tend to locate in larger urban areas with high concentration of knowledge and other talents. And although many small and medium cities have also managed to grow considerably, they do so when they are located in locations that are well connected to larger urban areas. This means that Norwegian cities will have to start thinking in terms of regional growth, connectivity and attractiveness rather than "municipal" attractiveness alone. Also, it implies that they will have to work together to manage both social challenges related to an increase in diversity and a growing demand for creative and innovative activities, and infrastructural challenges related to an increasing demand for mobility and connectedness.

### Appendix I: Norwegian Creativity Index, all results by city size

NCTI rank	Municipality	Norwegian Creativity Trend Index (NCTI)	Talent Trend (Rank)	Technology Trend (Rank)	Tolerance Trend (Rank)
1	Sola	1.000	1	2	60
2	Horten	0.921	25	1	46
3	Nøtterøy	0.904	9	4	11
4	Ullensaker	0.837	69	5	1
5	Nittedal	0.753	11	61	7
6	Time	0.735	4	22	25
7	Notodden	0.716	65	3	17
8	Askøy	0.703	7	55	21
9	Sørum	0.697	60	8	6
10	Malvik	0.683	2	57	58
11	Ski	0.671	30	59	8
12	Lier	0.668	38	12	14
13	Lillehammer	0.667	13	13	39
14	Frogn	0.665	5	19	51
15	Moss	0.664	35	6	23
16	Nannestad	0.659	56	25	2
17	Oppegård	0.648	3	75	16
18	Kongsberg	0.648	6	76	5
19	Stord	0.641	15	26	33
20	Harstad	0.631	16	38	27
21	Vestby	0.626	14	65	19
22	Levanger	0.622	17	41	28
23	Rælingen	0.605	23	24	29
24	Hamar	0.597	24	15	43
25	Nesodden	0.593	8	72	20
26	Narvik	0.586	19	16	52
27	Ås	0.580	33	67	13
28	Fjell	0.573	29	54	24
29	Stokke	0.570	34	73	4
30	Halden	0.567	71	17	12
31	Stjørdal	0.564	10	52	61
32	Askim	0.552	77	9	3
33	Røyken	0.549	12	71	30
34	Grimstad	0.543	18	68	26
35	Os	0.539	46	60	18
36	Flora	0.534	54	14	35

37	Nes	0.530	66	7	47
38	Kongsvinger	0.528	75	20	9
39	Lindås	0.527	20	44	59
40	Øvre Eiker	0.525	61	10	42
41	Stange	0.518	31	64	37
42	Kristiansund	0.517	28	35	56
43	Mandal	0.503	21	31	72
44	Gran	0.497	50	18	44
45	Molde	0.497	27	28	63
46	Kragerø	0.496	39	63	36
47	Verdal	0.493	26	23	67
48	КІерр	0.489	36	49	53
49	Vefsn	0.483	63	21	40
50	Alta	0.483	22	30	77
51	Orkdal	0.482	58	40	34
52	Bømlo	0.479	52	42	41
53	Nedre Eiker	0.461	48	74	10
54	Modum	0.453	62	39	45
55	Eidsberg	0.453	78	11	15
56	Voss	0.451	37	62	55
57	Bamble	0.439	64	27	50
58	Ringerike	0.437	53	69	22
59	Førde	0.433	42	43	68
60	Namsos	0.433	32	58	73
61	Strand	0.432	51	29	62
62	Gjøvik	0.432	41	70	38
63	Vennesla	0.425	67	37	49
64	Eigersund	0.422	49	32	70
65	Elverum	0.419	45	50	69
66	Steinkjer	0.418	40	46	74
67	Hå	0.418	68	47	48
68	Melhus	0.415	47	33	71
69	Ørsta	0.414	57	53	57
70	Kvinnherad	0.405	43	51	76
71	Eidsvoll	0.400	74	56	31
72	Vestvågøy	0.398	72	34	54
73	Østre Toten	0.390	44	36	78
74	Lenvik	0.388	59	48	66
75	Rana	0.379	55	45	75
76	Aurskog-Høland	0.285	73	66	65
77	Rygge	0.281	70	77	32
78	Vestre Toten	0.000	76	78	64

NCTI rank	Municipality	Norwegian Creativity Trend Index (NCTI)	Talent Trend (Rank)	Technology Trend (Rank)	Tolerance Trend (Rank)
1	Svelvik	1.000	82	2	8
3	Hurum	0.952	12	4	10
4	Strvn	0.923	73	26	2
6	Nord-Fron	0.879	40	1	56
8	Giesdal	0.867	23	6	26
9	Nome	0.867	56	5	32
10	Fnebakk	0.863	51	10	12
11	Elekkefiord	0.854	22	22	5
12	Røros	0.829	25	21	11
12	Holo	0.829	5	20	1/
1/	Re	0.828	16	20	14 Q
15	Ανοτάν	0.816	40 5 <i>1</i>	2 <del>4</del> Q	3/
16	Songdolon	0.810	54	5	34 A
17	Dø	0.813	04	54	4
10	DØ Midtro Gauldal	0.014	27	20	5 12
10	Lillosand	0.809	04 7	30 o	15
20	Åcnoc	0.807	62	о Э	40
20	ASHES	0.794	02	5 17	0U 21
21	Fidekog	0.788	31	1/	21
22	Eluskog	0.787	6U 0F	14	23
23	Nord-Auruar	0.781	65	11	33 25
24	Rauma	0.778	88	10	25
25	Vausø Tuedestrend	0.776	43	33	10
20	Tvedestrand	0.776	/1	29	18
27	iynset	0.775	48	35	15
28	Ardai	0.773	38	15	29
29	Grue	0.772	70	34	17
30	Sykkylven	0.771	79	64	1
32	Gjerarum	0.767	2	84	1
33	Sande	0.737	21	3/	27
35	Andøy	0.736	61	/	/1
37	Uistein	0.723	4	32	35
39	Inderøy	0.718	13	19	55
40	Sortland	0./1/	55	43	31
41	Giske	0.704	17	27	48
42	Vagsøy	0.699	59	25	57
43	Sund	0.697	66	53	30
44	Sør-Varanger	0.693	18	69	22
45	Văgan	0.691	83	48	37
46	Sel	0.691	50	13	72
47	Løten	0.687	74	42	46
48	Haram	0.683	39	52	38

### NCTI: results for all cities in the "Medium cities group"

49	Fet	0.682	10	83	6
50	Kvam	0.682	34	71	24
51	Nærøy	0.681	41	41	51
52	Osterøv	0.680	75	12	76
53	Farsund	0.672	80	28	64
54	Hadsel	0.669	52	51	45
55	Odda	0.669	87	23	69
57	Ivngdal	0.661	49	40	60
58	Sula	0.660	16	63	43
59	Vestnes	0.658	36	46	58
61	Meland	0.653	11	45	59
62	Volda	0.652	3	77	19
63	Gausdal	0.652	65	68	12
65	Klashu	0.632	42	61	52
67	Alstahaug	0.040	42 2 <i>1</i>	10	55 62
68	Sandro Land	0.041	24 70	45	51
60		0.037	70 01	20	54 70
70	Drannau	0.057	01	20	70
70	Brønnøy Trucil	0.030	47	44 75	07
/1	Trysli	0.035		75	41
72	Tysvær	0.634	15	72	47
/3	Meløy	0.627	86	36	/5
/4	Sunndal	0.625	29	60	61
75	Balsfjord	0.624	76	73	52
76	Lunner	0.621	30	57	65
79	Søgne	0.615	20	62	66
80	Surnadal	0.610	35	31	82
83	Ørland	0.602	77	55	73
84	Andebu	0.600	58	79	36
85	Eid	0.599	28	50	77
86	Rissa	0.596	37	39	84
88	Rakkestad	0.580	53	81	39
91	Jevnaker	0.567	32	80	49
92	Herøy	0.565	44	58	79
93	Oppdal	0.565	14	74	74
94	Skaun	0.563	8	59	81
95	Nordre Land	0.556	72	18	88
96	Gloppen	0.556	19	65	83
100	Tinn	0.553	89	82	44
102	Nord-Odal	0.543	57	78	68
103	Fauske	0.539	33	70	85
104	Holmestrand	0.528	45	87	20
107	Kvinesdal	0.499	69	47	87
109	Sogndal	0.492	9	76	86
116	Råde	0.469	6	85	78
118	Randaberg	0.459	1	67	89
120	Sør-Odal	0.448	63	86	63
141	Risør	0.340	26	88	28
158	Fræna	0.261	67	89	50
100		0.201			20

NCTI rank	Municipality	Norwegian Creativity Trend Index (NCTI)	Talent Trend (Rank)	Technology Trend (Rank)	Tolerance Trend (Rank)
1	Gierstad	1.000	44	1	76
3	Drangedal	0.866	65	3	6
4	Fialer	0.832	5	23	1
7	Nes	0.703	35	5	29
9	Sigdal	0.698	72	4	61
10	Overhalla	0.671	37	2	103
14	Marker	0.630	68	11	14
15	Evje og Hornnes	0.626	23	45	3
16	Hielmeland	0.625	55	95	2
17	Steigen	0.611	15	55	4
19	Suldal	0.602	62	57	5
20	Dovre	0.600	91	6	80
23	Stranda	0.585	41	36	12
24	Kárásjohka Karasjok	0.585	86	62	8
26	Bremanger	0.583	82	49	10
27	Vik	0.577	42	42	11
28	Vinje	0.573	59	7	74
29	Verran	0.569	107	10	33
30	Ringebu	0.563	88	28	19
33	Etne	0.561	14	51	17
34	Leksvik	0.556	38	14	32
35	Lyngen	0.553	87	20	25
37	Finnøy	0.552	8	70	15
38	Rennesøy	0.552	3	13	34
39	Aukra	0.550	17	77	13
41	Gol	0.543	18	93	7
42	Gaular	0.539	46	9	57
43	Luster	0.537	31	63	18
44	Frøya	0.537	94	48	20
46	Skiptvet	0.532	20	18	36
47	Birkenes	0.532	43	52	21
48	Tysnes	0.528	25	27	31
49	Froland	0.523	34	19	41
52	Austrheim	0.519	4	12	59
53	Lund	0.516	90	65	23
54	Sande	0.513	49	46	30
55	Porsanger	0.506	51	82	22
	Porsangu Porsanki				
56	Deatnu Tana	0.505	53	30	44
60	Nordkapp	0.500	71	41	39

### NCTI: results for all cities in the "Small cities group"

62	Hitra	0.491	77	50	40
63	Bardu	0.488	2	44	45
64	Åmot	0.484	61	35	53
65	Aure	0.483	1	79	35
66	Høyanger	0.481	36	38	51
67	Øyer	0.480	57	87	26
68	Saltdal	0.474	78	32	62
69	Nordreisa	0.474	93	58	48
70	Kviteseid	0.472	67	88	28
71	Meldal	0.471	97	21	73
72	Selje	0.469	76	24	69
73	Skodje	0.468	22	85	37
76	Radøy	0.465	45	29	68
77	Tjøme	0.464	69	78	46
78	Askvoll	0.461	99	33	70
79	Gjemnes	0.461	26	76	49
80	Ballangen	0.458	33	86	38
81	Eide	0.456	80	61	58
82	Hurdal	0.456	100	73	52
83	Øystre Slidre	0.456	92	68	54
84	Våler	0.453	85	16	93
85	Vikna	0.452	13	53	65
86	Naustdal	0.451	98	15	95
87	Sokndal	0.450	79	26	83
88	Vaksdal	0.449	39	34	79
90	Hvaler	0.448	89	96	27
91	Ullensvang	0.448	10	59	64
92	Nesset	0.446	19	43	77
94	Selbu	0.444	83	22	89
96	Hemne	0.442	30	17	94
98	Trøgstad	0.440	66	91	43
99	Flesberg	0.438	21	72	66
100	Sauherad	0.437	47	102	16
102	Jølster	0.432	12	64	75
104	Sørreisa	0.430	96	47	84
105	Hol	0.430	101	92	47
106	Seljord	0.430	27	90	50
107	Rennebu	0.427	73	80	72
109	Fitjar	0.426	7	8	107
111	Tingvoll	0.421	104	107	9
112	Skånland	0.418	28	25	100
114	Austevoll	0.415	74	89	60
115	Bjerkreim	0.415	48	31	98
116	Hobøl	0.415	40	101	24
117	Øygarden	0.414	6	75	81
118	Sør-Fron	0.414	16	54	90
119	Åfjord	0.413	84	67	88
120	Lindesnes	0.412	58	71	86
121	Vanylven	0.411	64	56	91

122	Hemnes	0.410	103	40	97
123	Fusa	0.408	24	74	87
124	Nore og Uvdal	0.404	81	94	63
126	Øksnes	0.401	106	69	92
129	Bjugn	0.387	54	37	104
131	Vågå	0.383	56	66	101
134	Skjervøy	0.380	102	39	105
135	Bø	0.377	60	84	96
136	Kvæfjord	0.375	11	81	99
139	Hareid	0.366	32	97	71
143	Meråker	0.352	70	60	106
145	Sør-Aurdal	0.348	50	98	82
147	Ål	0.343	75	105	42
152	Hof	0.318	29	100	85
154	Guovdageaidnu	0.314	108	83	108
	Kautokeino				
157	Sauda	0.307	52	104	67
159	Våler	0.303	105	103	78
160	Spydeberg	0.302	63	106	55
161	Sveio	0.299	9	108	56
164	Stor-Elvdal	0.295	95	99	102

### NCTI: results for all cities in the "Tiny cities group"

NCTI rank	Municipality	Norwegian Creativity Trend Index (NCTI)	Talent Trend (Rank)	Technology Trend (Rank)	Tolerance Trend (Rank)
1	londal	1 000	76	1	70
2	Bygland	0.967	51	2	90
4	Modalen	0.751	115	3	9
7	Fvresdal	0.671	22	77	1
8	Røyrvik	0.663	87	4	47
9	Hemsedal	0.645	90	42	2
10	Åmli	0.633	82	5	16
11	Midsund	0.633	54	16	4
12	Balestrand	0.624	52	53	3
13	Stordal	0.624	83	37	5
15	Ørskog	0.601	11	15	7
16	Dønna	0.597	110	9	10
17	Siljan	0.595	6	6	29
20	Gratangen	0.581	92	95	6
22	Bjarkøy	0.578	114	61	8
23	Utsira	0.571	21	46	11
24	Flå	0.567	116	24	13

25	Værøy	0.564	117	44	12
26	Ibestad	0.564	108	22	15
27	Leka	0.562	124	7	54
28	Etnedal	0.550	4	108	14
29	Marnardal	0.549	73	91	17
30	Hamarøy	0.541	103	61	20
31	Lebesby	0.539	93	87	19
32	Leikanger	0.534	1	79	22
33	Storfjord	0.534	53	23	25
35	Leirfjord	0.532	33	103	21
36	Vang	0.531	18	25	26
37	Nesna	0.530	43	28	30
38	Hyllestad	0.527	98	61	24
40	Måsøy	0.524	68	88	23
41	Norddal	0.524	120	43	32
42	Audnedal	0.524	56	32	34
43	Moskenes	0.523	126	54	31
44	Snillfjord	0.520	35	8	68
46	Sandøy	0.519	69	92	33
48	Gáivuotna-Kåfjord	0.514	29	104	35
49	Aremark	0.514	88	20	48
50	Sirdal	0.513	40	13	59
51	Herøy	0.512	74	97	38
52	Holtålen	0.512	62	61	41
53	Lierne	0.509	10	90	39
54	Os	0.508	5	49	43
55	Eidfjord	0.507	32	112	37
56	Båtsfjord	0.507	123	98	42
57	Fedje	0.507	100	107	40
58	Loppa	0.506	99	50	45
59	Lødingen	0.506	125	51	46
60	Karlsøy	0.504	102	56	49
61	Granvin	0.503	65	95	44
62	Aurland	0.501	57	12	80
63	Tranøy	0.500	81	35	56
64	Solund	0.500	109	123	28
65	Salangen	0.499	37	45	53
66	Tolga	0.499	2	27	61
67	Lardal	0.499	15	30	58
69	Namdalseid	0.496	77	29	64
71	Kvalsund	0.494	17	52	57
72	Åseral	0.493	34	122	36
73	Torsken	0.492	118	33	67
74	Folldal	0.492	12	124	27
75	Smøla	0.490	42	36	72
76	Hægebostad	0.490	39	18	79
77	Bokn	0.490	128	61	65
79	Unjárga Nesseby	0.487	14	99	62
80	Tjeldsund	0.487	79	93	63
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81	Frosta	0.486	20	82	66
82	Agdenes	0.486	25	31	78
83	Masfjorden	0.485	27	111	60
85	Hattfielldal	0.482	50	61	76
86	Samnanger	0.482	61	73	77
87	Snåsa	0.480	13	117	51
88	Tokke	0.480	19	118	50
89	Fosnes	0.480	26	109	71
90	Hiartdal	0.474	46	86	82
91	lurøv	0.473	40	85	8/
02	Skišk	0.473	47	81	85
02	Pondalon	0.472	111	101	83
0/	Grong	0.472	20	101	75
94 06	Borg	0.472	50	114	73
90	berg	0.469	50	110	09
97	LOM	0.468	60	80	80
98	UIVIK	0.467	23	113	81
99	Namsskogan	0.464	121	120	/3
100	Kvitsøy	0.463	24	/8	89
101	Lesja	0.463	59	84	88
102	Roan	0.462	91	55	93
103	Gulen	0.461	96	74	94
105	Mosvik	0.461	104	48	95
107	Vegårshei	0.458	85	106	91
108	Sørfold	0.458	119	41	98
109	Gildeskål	0.457	30	105	92
110	Høylandet	0.456	3	26	104
111	Flakstad	0.454	71	89	97
112	Rødøy	0.454	86	38	103
113	Dyrøy	0.454	9	58	99
114	Sømna	0.453	36	100	96
115	Træna	0.452	107	61	100
116	Osen	0.452	48	61	101
117	Grane	0.451	113	75	102
118	Nissedal	0.449	63	125	74
121	Rømskog	0.444	41	121	87
122	Vestre Slidre	0.444	80	76	106
124	Rindal	0.443	55	21	108
125	Flatanger	0 442	49	17	110
126	Alvdal	0.441	64	126	55
120	Reiarn	0.438	97	61	107
120	Hornindal	0.430	97 97	57	107
120	Pact	0.432	122	115	105
121	Tudal	0.431	67	11	105
122	iyuai Valla	0.420	70	20	112
1252	Vdile	0.423	70 66	39 14	112
132	Norde	0.408	00	14 24	
130	vardø	0.408	101	34	115
137	iystjora	0.405	84	83	113

138	Berlevåg	0.403	89	94	114
139	Lærdal	0.403	7	119	111
140	Bindal	0.402	31	47	117
141	Evenes	0.400	78	59	118
142	Hasvik	0.397	72	61	119
145	Rollag	0.393	16	10	126
147	Iveland	0.391	28	127	18
148	Gamvik	0.391	127	61	120
150	Vega	0.389	75	19	123
152	Engerdal	0.385	106	60	122
156	Forsand	0.371	112	102	124
157	Lavangen	0.368	8	61	127
159	Vevelstad	0.365	95	110	125
178	Bykle	0.274	105	40	128
193	Krødsherad	0.233	45	128	52

## **Appendix II: Methods**

## A1. How the Norway Creativity Index is built

The Norway Creativity Index is composed by three Indices: the Talent Index, the Technology Index and the Tolerance Index, each of which has the same weight (1/3rd). Each of these indices is in turn composed by two to three indicators, whose definition, sources and reference years are summarized in Table 13.

## TABLE 13

Dimension	Indicator	Definition	Year(s)				
	Human Capital	Percentage of Population over 20 yrs. with Graduate Education (bachelor degree)	2007				
TALENT	Creative Class	Percentage of Workforce engaged in "Creative Occupations" (ISCO- 88)	2007				
	Super Human Capital	Percentage of Population over 20 yrs. with Post-Graduate Education (Master or PhD)	2007				
TECHNOLOCY	Innovation	Patents Granted per 10,000 population	2007				
TECHNOLOGY	High Tech Industry	Share of workforce employed in High Tech Industry	2007				
	Diversity Index	Fragmentation Index based on presence and ethnic background of foreign born population	2007				
IULEKANCE	Bohemians	Percentage of workforce engaged in artistic activities (artists, writers etc.)	2007				

Source: Statistics Norway (Statistisk sentralbyrå, www.ssb.no/english)

For Patents: Norwegian Industrial Property Office (Patentstyret, http://www.patentstyret.no/en/english)

The municipality values for each indicator were standardized by applying the formula:

$$V_{j} = \frac{X_{j} - Min_{j}}{(Max_{j} - Min_{j})}$$

Where *Vij* is the standardized value of municipality *i* on indicator *j*, *Xij* is the actual value reported by municipality *i* on indicator *j*, *Minj* is the minimum value registered among all municipalities for indicator *j* and *Maxj* is the maximum value registered for indicator *j*.

The resulting figures are values in the 0-1 range, where 1 corresponds to the best performing region and zero to the worst performing one.

The values for the main indices (Talent, Technology and Tolerance) are obtained through the average of the standardized scores reported by the cities on each indicator.

## A2. How the Diversity Index has been computed.

The Diversity Index has been built based on a typical "fractionalization index", frequently used in economics and public policy studies. The formula used is the following:

$$Diversity_c = 1 - \sum_{i=1}^m (x_i)^2$$

Where Xic is the share of population from country *i* living in city *c*.

In the context of Norwegian cities the index has been slightly modified: due to data availability, the origins of foreigners have been classified in two groups only: those coming from western countries and those from non-western countries.



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